

I Sense My Digital Assistants! Assessing the Impact of Customers' Immersive Experience and Perceived Social Presence on Purchase Intention

Abstract

Little is known about how digital assistants (DAs) evoke customers' immersive experience and perceived social presence, as does the extent to which these social values translate into purchase intention in human-computer interaction. Drawing on the Stimuli-Organism-Response framework and the Theory of Consumption Values, this study examines the nexus among social attributes (behavioral and form realism), customer perceived value, customer engagement, and purchase intention. The study was carried out in Bangladesh, highlighting least-developed countries (LDCs) in broad aspects. Purposive sampling was used to collect primary data from 352 customers familiar with DAs. Analysis through partial least squares structural equation modeling (PLS-SEM) reveals that behavioral realism and form realism significantly enhance immersive experience and perceived social presence. Immersive experience, as a perceived social value, strongly influences both perceived social presence and purchase intentions, while perceived social presence is also directly linked to purchase intentions. Moreover, high customer engagement with DAs significantly enhances the association between customer immersive experience and purchase intention. These insights deepen our understanding of the drivers and outcomes of perceived social values, address a new attribute-value-outcome-based model from DAs and information systems perspectives, and offer practical guidance on optimizing social attributes to strengthen customer perceived value and purchase intention.

Keywords: digital assistants, immersive experience, perceived values, social presence, attributes, purchase intention

1. INTRODUCTION

The blessing of artificial intelligence (AI), machine learning (ML), big data, and blockchain is rapidly transforming the service marketing landscape (Boian et al., 2024; Park et al., 2023; Yen & Chiang, 2021). In this context, Digital Assistants (DAs), including Alexa, Siri, Crotona, Google Assistant, and other conversational agents, are novel additions. Leading firms, e.g., Ocado, Amazon, PayPal, Baidu, Samsung Electronics, and Uber, are progressively replacing their frontline employees with DAs due to their enhanced interaction capabilities (Brill et al., 2022; Candao et al., 2023). However, despite the growing implementation of DAs in service marketing, there is a limited understanding of how the anthropomorphic attributes (i.e., behavioral and form realism) of these cutting-edge technologies shape customer value perceptions (Rahman et al., 2024).

DAs' anthropomorphic attributes have increasingly been recognized as essential social elements (Pal et al., 2022; Polyportis & Pahos, 2024; Song et al., 2023; Whang & Im, 2021). For instance, Fernandes and Oliveira (2021) noted anthropomorphism as a key social trait in a DA-mediated context. Regarding perceived social values, Pelau et al. (2021) suggested that AI agents with gendered voices can evoke social emotions in customers, as a humanlike voice often creates the impression of speaking with a real person, underscoring the criticality of perceived social presence in customer-DA communication. Likewise, several studies (e.g., Lee and Nass (2003); Nass et al. (1994) evidenced how users were convinced to treat computers as companions with anthropomorphic attributes despite knowing they were dealing with lifeless machines.

Adding to that, by enhancing users' emotional connections and sense of presence, DAs' social attributes promote immersive experiences in interactions with technology (Miao et al., 2022). The longer users engage in behavioral and form realism-enabled immersive environments, the stronger their community bonds become, indicating that immersion fosters social connections (Cheney et al., 2019). Indeed, when customers are actively engaged, they perceive higher levels of both social and functional values, making them more likely to view the interaction with DAs as beneficial and relevant to their needs (Pal et al., 2022). These findings collectively emphasize that in customer-DA interactions, where trust and engagement are critical, integrating social attributes with customer-perceived values is essential. Such integration offers valuable insights for advancing academic research on human-DA dynamics, particularly in understanding the roles of immersive experience, social presence, and customer engagement.

Research indicates that consumers often feel discomfort when interacting with complex AI-enabled DAs, perceiving potential risks and uncertainties (McLean & Osei-Frimpong, 2019) that manifest as perceived costs. Indeed, customers may exhibit reluctance to engage even with human agents (Fakhimi et al., 2023), let alone with machine-based agents. To encounter such challenges, prior studies have emphasized endowing AI agents with social traits - anthropomorphism through behavioral and form realism (Miao et al., 2022) - aiming to amplify customer value perceptions (Rahman et al., 2024). Nonetheless, the impact of DAs' behavioral and form realism on customer-perceived social values (e.g., customer immersive experience and perceived social presence) remains underexplored empirically. This underpins the current study to build on the Theory of Consumption Values (TCV) (Sheth et al., 1991), and quantify how DAs' social attributes trigger customer immersive experience and evoke a sense of social presence, and mitigate perceived costs in the process.

Additionally, it is critical to investigate whether these attribute-value linkages lead to specific behavioral outcomes, such as purchase intentions (Rahman et al., 2024). In this connection, while previous studies predominantly explore the direct relationship between perceived customer values and behavioral outcomes (e.g., Fernandes & Oliveira, 2021; Pal et al., 2022; Sharma & Sharma, 2023; Sharma et al., 2022), the literature notably lacks insights into how DAs' anthropomorphic attributes may interact with customer immersive experience and social presence within a DA-mediated context to drive purchase intentions. These insights are particularly salient within the context of least-developed countries (LDCs), where the deployment of and the dynamics of customer engagement with DAs remain in an emergent phase, thereby warranting heightened scholarly focus for further exploration (Rahman et al., 2024).

Drawing on the above discussions, this study aims to investigate how DAs' social attributes, perceived social values, and customer engagement interact to enhance customers' purchase intentions in LDCs. Accordingly, the current research contributes to the existing knowledge of human-DA literature from three key aspects. *First*, it explores a new perspective of an attribute-value-outcome framework coined by Rahman et al. (2024). In their recommended framework, Rahman and his colleagues pointed out that AI avatars' behavioral and appearance-related traits may substantially impact customers' perceptions and behavioral outcomes. Although voluminous studies have examined diverse adoption and usage behaviors of DA users in various settings, such as public health (Jin & Eastin, 2024), retail (Sindhu & Bharti, 2024), banking services (Priya & Sharma, 2023), hotels and tourism (Buhalis & Moldavska, 2022), empirical research on the attribute-value-outcome-based framework in retail settings has been emerged as a new debate. Hence, examining and quantifying the mechanism is imperative to deepen our understanding of the technology-mediated environment.

Second, given the exploration of a three-phase interconnection (digital assistants' social attributes–perceived social values–purchase intentions), our study integrates the Stimuli-Organism-Response (SOR) framework (Mehrabian & Russell, 1974) with the relatively underexplored TCV theory within a technological context. Broadening these theories to encompass a novel perspective, this research thoroughly investigates and presents that behavioral realism and form realism will become increasingly crucial in affecting customer-perceived values dragging toward purchase intentions. The extant research suggests that people tend to apply social cues to technologies possessing human attributes (Li et al., 2021). Herein, DAs' anthropomorphic features in the form of behavioral and form realism (Miao et al., 2022; Pal et al., 2022) may impact the bondage development between humans and machines.

Third, this research also pioneers an examination of the little-known connections from immersive experience and perceived social presence to purchase intentions, a departure from the predominant focus on customer attitudes, behaviors, and satisfaction in digital commerce studies (Guo & Luo, 2023; Scholz & Smith, 2016). Confirming the novelty and relevancy, this study therefore substantially adds value to the literature in digital marketing by illustrating a fresh mechanism where perceived social values (i.e., immersive experience and social presence) act as organisms between DAs' social attributes (stimuli) and customer purchase intentions (response).

2. LITERATURE REVIEW

2.1 Understanding DAs

DAs are used interchangeably with various AI-enabled agents, such as voice assistants, AI-enabled chatbots, virtual agents, virtual influencers, conversational agents, and chatbot assistants (Brill et al., 2022; Hauswald et al., 2015; Sharma et al., 2022). These DAs “use inputs such as the user’s voice, vision (images), and contextual information to assist users by answering a question in natural language, making recommendations, and performing actions” (Hauswald et al., 2015, p. 223). Leveraging AI applications, DAs can operate autonomously without or with less human intervention, resulting in a decreasing customer turnover rate from the company aspect. Their growing popularity and potential have led companies in various sectors to adopt DAs to enhance customer experience and engagement. For instance, DAs allow users to assist in purchasing fast-moving goods (FMCG), making airline reservations, buying books, and so forth (Sharma et al., 2022). Bank of America’s Erica enables swift money transfers and payments to companies, friends, or family. In the hotel and tourism industry, Asksuite, an AI hotel booking chatbot, utilizes a chat-enabled interface for hotel search and booking.

2.2 Social Attributes of DAs

Product attributes include various features that help characterize a product, offering customers essential information to facilitate searching, comparing, and purchasing decisions. Gwin and Gwin (2003) defined product attributes as a bundle of utilities or features, like gas mileage, horsepower, styling, and safety in automobiles. Attributes may be hedonic, utilitarian, or social in nature. In this study’s context, DA’s social attributes are related to the qualities or features that influence how they are perceived and used to foster social interaction, convey personality, and adapt to social norms. Prior research (Pal et al., 2022) on DAs’ social attributes has emphasized their potential to provide social support, manage loneliness, and enhance communication, particularly in digital platforms. Thakur and Han (2018) uncovered DA as a

cost-effective solution to support elderly citizens by providing social support and instilling positive moods. Similarly, Krämer (2008) highlighted the social dimension of embodied conversational agents, noting how these agents can elicit social responses from users. While facing virtual agents, individuals often exhibit interactive behaviors that closely resemble those in human-to-human interaction.

Understandably, DAs' social attributes evoke social values, and according to the TCV, customer-perceived values are essential drivers of their purchase intentions and behaviors. TCV encompasses functional, social, emotional, epistemic, and conditional values; however, exploring social values within the context of DAs is deemed worthwhile, as the very purpose of DAs in replacing human assistants is anchored in their anthropomorphic features that embody social attributes to intensify users' social values (Miao et al., 2022). Indeed, the social characteristics of DAs are found to be interconnected with customer value perceptions. For example, Sharma et al. (2022) reported that DAs' social features, enhancing perceived interactivity and anthropomorphism, can boost purchasing intentions by fostering customer engagement. Likewise, Pal et al. (2022) investigated voice-based consumer electronic devices and identified that these devices have anthropomorphic capabilities that elicit customer trust to stimulate purchase intention. Despite such insights, empirical research integrating DAs' social attributes and customer social value perceptions - particularly in terms of how they collectively influence purchase intentions - is sparse, which this study seeks to address.

2.3 Perceived Social Values and Theoretical Frameworks

TCV explains how consumers make consumption choices by considering values (Sheth et al., 1991). Social value, a key dimension within TCV, represents the perceived utility of linking a product or service to specific social groups, such as demographic, socioeconomic, or cultural-ethnic groups (Sheth et al., 1991). As mentioned, this study builds on TCV, suggesting that certain values - in this case, social values - can lead to behavioral outcomes like purchase intentions. The current research conceptualized perceived social presence and customer immersive experience as social values in a human-DAs interaction. Social presence refers to the feeling that a DA is attentive, responsive, and humanlike, creating the illusion of a real social partner (Fernandes & Oliveira, 2021; Pal et al., 2022). When DAs exhibit anthropomorphic qualities, users experience a heightened sense of interactional reality, perceiving the DA as an engaging entity rather than a mere tool (Pal et al., 2022; Lee & Nass, 2003), which aligns with the social aspect of value in TCV. Similarly, immersive experience in human-computer interactions involves deep engagement, where users feel absorbed (Partarakis & Zabulis, 2024), often responding as if the DA were a real person. This immersion contributes to social value by fostering a sense of shared space and meaningful connection with DAs, akin to a conversation with another person.

On the other hand, the SOR model presents the associations among stimuli (S), organism (O), and response (R) (Mehrabian & Russell, 1974). In this model, stimuli encompass external factors influencing the organism. The organism, positioned as an internal processing unit, mediates how individuals interpret the stimuli and move toward a particular outcome, known as the response, which reflects behavioral outcomes (Mehrabian & Russell, 1974). Former studies have applied the SOR model in various DAs and retail settings. For example, Maduku et al. (2023) examined customer usage intention of DAs with their commitment, passion, and word-of-mouth intentions. Similarly, Li et al. (2023) underpinned the SOR model to discover how live-streaming ambient elements, presence, and perceived trust affect customer purchase intentions in technology contexts.

In this study, blending the SOR model and the TCV offers a robust framework to assess the intricate consumer interactions with DAs. The SOR model provides a dynamic structure by mapping DAs' anthropomorphic qualities as stimuli and effectively capturing the nuanced way users process these traits cognitively (the "organism") before translating them into behavioral outcomes (the "response"). Meanwhile, TCV provides a value-based lens that highlights how specific values, particularly social ones, are crucial in driving consumer behavior within human-DA interactions. Social presence and immersive experience are critical forms of social value that arise directly from DA anthropomorphism, making TCV an ideal theoretical complement to SOR. While SOR captures the processual aspects, TCV explains why specific DA attributes hold appeal by emphasizing the importance of perceived value. Together, these frameworks enable a layered understanding of how and why DAs influence consumer behavior. Going beyond alternative models like the Technology Acceptance Model (Davis et al., 1989) and the Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003), which prioritize usability and technology adoption, the SOR and TCV framework addresses the unique three-phase interaction between DA attributes, perceived social values, and behavioral outcomes in digital settings.

2.4 DAs' Anthropomorphism

Anthropomorphism is the act of attributing humanlike features, traits, or actions to animals or inanimate objects. Klein and Martinez (2023, p. 2794) conceptualized it as "the tendency to deploy human attributes, physic characteristics, feelings, and traits onto a nonhuman object." Research suggests that such projection of human attributes onto DAs serves to comprehend and describe how they behave and respond. For example, Alexa's humanlike voice can swiftly capture users' attention and foster emotional connections, while Samsung's Bixby utilizes anthropomorphic intelligence to remind users of events and respond to voice commands. DAs' interactive style and mannerisms also positively affect user engagement; Fakhimi et al. (2023) observed that customers appreciate choosing their preferred gender, voice (such as a celebrity's), or accent (like Irish). In reflection, the authors of this study assume that customers feel comfortable and perceive that they are conversing with someone or something humanlike.

Extant studies (Fernandes & Oliveira, 2021; Miao et al., 2022; Polyportis & Pahos, 2024; Whang & Im, 2021) have highlighted the essential role of DAs' anthropomorphism in interpreting customer behavior within human-computer interactions. In their seminal work, Miao et al. (2022) categorized anthropomorphism into two major types: form realism and behavioral realism. They referred to behavioral realism as the capacity of digital entities to respond, communicate, and behave naturally, whereas form realism pertains to the degree of resemblance between an agent and a person. I. Kim et al. (2024) further elucidated the intricate interplay between form and behavioral realism in shaping consumer perceptions that influence purchase intentions. Expanding on these studies, the present research investigates how DAs' anthropomorphic qualities - both form and behavioral realism - enhance customers' purchase intentions by amplifying their perceived social values (refer to Figure 1). All the constructs operationalized in this study are defined and shown in Table 1.

3. HYPOTHESIS DEVELOPMENT

3.1 Behavioral Realism and Form Realism Toward Perceived Social Values

Empirical research on DA's behavioral realism is relatively new, although research shows that it impacts both emotional and social rapport between agents and customers (Bailenson et al.,

2006; Jun & Bailenson, 2020). Despite DA's lack of embodiment compared to 3D virtual influencers, designers have successfully incorporated cognitive intelligence (e.g., learning power and decision-making) in DAs. According to the Means-End Chain (MEC) framework outlined by Gutman (1982), consumer behavior is goal-oriented, linking product or service attributes (observable features) to desired consequences and values. In addition, Rahman et al.'s (2024) attribute-value-outcome framework suggests that customer values are derived from attributes, which direct customers to initiate behavioral outcomes. Building on these theoretical lenses, DA's attributes (behavioral and form realism) are supposed to impact customer-perceived social values: immersive experience and social presence.

Turner et al. (2016, p. 28) defined immersive experience as "being positively associated with the degree of technologically-mediated sensory richness that facilitates isolation or decoupling from the real world." Simply put, it explains how well a computer system can evoke an illusion of vivid reality for users. DAs' cognitive responses (e.g., verbal or nonverbal) significantly impact users' sense of immersion (Kim et al., 2023; Kim et al., 2018). In fact, behavioral realism of DAs (responding, communicating, and behaving naturally) makes users feel as if they are communicating with a real person, heightening their immersive experience. Supporting this, Ben Saad (2024) illustrated the role of immersive technologies in digital settings, suggesting that behavioral and form realism-enabled virtual agents create an engaging, immersive experience for users. Park and Yoo (2020) further posited that this experience plays a crucial role in facilitating mental imagery while shopping on mobile websites.

Moreover, DAs' behavioral traits significantly influence users' sense of social presence (Fakhimi et al., 2023). Indeed, when digital assistants exhibit humanized attributes, they can elicit a feeling of social presence in users (Pal et al., 2022). Empirical research has consistently shown a connection between behavioral realism and customer perceptions and experiences. For instance, Sharma and Sharma (2023) emphasized that virtual assistants' anthropomorphic qualities align well with users' socio-psychological expectations (e.g., social presence) in digital contexts, while Miao et al. (2022) strongly posited that behavioral realism and social presence are positively related. The above reasonings motivated this study to assert that humanlike responses from DAs foster immersion and social presence in customer interactions, underpinning the subsequent hypothesis:

H1a: Behavioral realism positively and significantly impacts immersive experience.

H1b: Behavioral realism positively and significantly impacts the perceived social presence.

As conceptualized above, form realism is a spatial and dynamic ability that reflects how closely an AI agent resembles a human (Bailenson et al., 2006). Nowak et al. (2015) noted that a higher form of realism in AI avatars allows users to develop social expectations, desiring that the agents will provide social support. Given that, managers realize the urgency of imbuing DAs with humanlike form attributes (e.g., human voice) and other features like name, gender, race, nationality, and age. Drawing on the importance of these attributes, recent studies have also highlighted building an ideal interface with appropriate humanlike features (Alimamy & Kuhail, 2023) to evoke customer immersiveness and social presence. In his regard, Kim et al. (2024) showed that anthropomorphic attributes of virtual agents are positively related to customer immersion.

Building on the Anthropomorphism Theory, Miao et al. (2022) proposed a strong link from form and behavioral realism to their impact on perceived social presence. It is observed that greater visual realism in immersive virtual environments enhances the sense of presence and

induces higher stress levels (Kim et al., 2018). Existing literature has also revealed that higher levels of realism in immersive virtual experiences positively impact user experience (Hilken et al., 2022; Schindler & Bickart, 2012), particularly where more realistic avatars lead to a stronger sense of presence and improved social interaction quality (Jun & Bailenson, 2020). Based on these findings, the authors predict that DAs' form realism may substantially influence users' immersive experience and perceived social presence. Thus, the authors posit that:

H2a: Form realism positively and significantly impacts immersive experience.

H2b: Form realism positively and significantly impacts perceived social presence.

Table 1. Definition of the constructs operationalized in this study.

Constructs	Definition	Source References
Behavioral Realism	Behavioral realism refers to the capacity of DAs to respond, communicate, and behave naturally like humans.	e.g., I. Kim et al. (2024); Bailenson et al. (2006); Miao et al. (2022)
Form Realism	Form realism is the extent to which the DAs' appearance resembles humans.	e.g., I. Kim et al. (2024); Bailenson et al. (2006); Miao et al. (2022)
Immersive Experience	Immersive experience refers to an individual's subjective feeling of being positively absorbed or deeply engaged in a technologically-mediated environment, influenced by sensory richness that facilitates isolation or decoupling from the real world.	e.g., Dağ et al. (2023); Hansen (2014)
Perceived Social Presence	Perceived social presence refers to how a person perceives DAs' interactions as friendly, warm, empathetic, personal, or intimate.	e.g., Sharma et al. (2022); Mimoun and Poncin (2015); Fernandes and Oliveira (2021)
Customer Engagement	Customer engagement is a dynamic and ongoing interaction with a service, product, brand, or organization, encompassing psychological, physical, and emotional involvement.	e.g., Carvalho and Fernandes (2018); Alalwan et al. (2020); Pansari and Kumar (2017)
Purchase Intention	Purchase intention is a customer's likelihood or willingness to buy a product or service based on needs, preferences, and external influences.	e.g., Guo and Luo (2023); Sharma et al. (2022)

3.2 Immersive Experience, Perceived Social Presence, and Purchase Intention

Immersion combines the spatial and temporal components of a consumer experience (Hansen, 2014). There has long been a tradition in academia to address the relevance of consumer immersion in experiences (Hansen, 2014; Kim et al., 2018). In a technology-mediated environment, immersion experience creates a feeling of 'being there' (Parise et al., 2016). Parise and his colleagues characterized immersion into a) breadth - number of touchpoints engaged in an interaction, and b) depth - richness or quality of information conveyed across these touchpoints, encompassing sensory elements such as visual, tactile, and auditory cues. Immersive experiences reduce the psychological distance and make the interaction feel more like a social exchange rather than an impersonal, transactional experience. DAs converse with

consumers in a humanlike voice and reply to queries using cognitive intelligence like a real person. Such auditory and cognitive humanlike responses trigger consumers' sense of being present there. This sense of being "present" with the DA can heighten perceived social presence (Fakhimi et al., 2023). In this regard, Middleton (2005) concluded that mental imagery via technology impacts the sense of presence. Hence, it is worth proposing that:

H3a: Immersive experience positively and significantly impacts perceived social presence.

As emphasized, immersive experiences in DA interactions may deliver social value. Theoretically, the TCV suggests that perceived social values motivate users' behavior, including purchase intentions. According to the SOR framework, external features like DAs' anthropomorphic characteristics (stimulus) positively influence the internal state by fostering immersive experience (organism) that may drive users' 'response', such as purchase intentions. Kim et al. (2023) observed that higher levels of social presence increase users' trust and engagement with DAs, facilitating positive emotions and greater comfort, factors that can directly influence purchase intentions. Research (Hudson et al., 2019; Miao et al., 2022; Sharma & Sharma, 2023) further shows that when users feel an authentic social connection during interactions with technology, they tend to exhibit greater loyalty, satisfaction, and willingness to make purchasing decisions. Additionally, immersive experiences enable consumers to form mental imagery that can enhance their inclination to purchase online (Park and Yoo (2020); Pathak and Prakash (2023)). In light of these theoretical and empirical grounds, it is worth positing that:

H3b: Immersive experience positively and significantly impacts purchase intention.

Perceived social presence is the extent to which a communication medium is viewed as friendly, warm, empathetic, personal, or intimate during contact (Fernandes & Oliveira, 2021; Pal et al., 2022). Although social presence research usually focuses on human relationships facilitated by technology, it can be used to interact with technical artifacts, such as DAs (McLean & Osei-Frimpong, 2019). Nass et al. (1994) revealed that people unintentionally attribute social cues (e.g., name and gender) to computers. These cues, associated with human traits, naturally trigger social responses. Scholars (see Sharma et al., 2022; Skalski & Tamborini, 2007) underlined the importance of social presence in developing reliable and amicable connections with technology to determine whether it positively leads to customer behavioral outcomes. However, how perceived social presence in real-time interactions with DAs impacts consumer purchase intention lacks empirical evidence.

It is assumable that if an interaction with DAs seems warm, friendly, and interactive with quality information, customers may seek help from DAs to make their purchase decisions. This assumption reflects TCV's reasoning that social values influence behavior, and the SOR model's conception that external stimuli (such as DAs' anthropomorphic attributes) positively impact users' internal states (perceived social presence), ultimately leading to favorable behavioral responses. In line with this, Miao et al. (2022) proposed that social responses (e.g., social presence) positively influence customers' likelihood of purchasing. Quoting that proposition, the current study postulates that:

H4: Perceived social presence positively and significantly impacts customer purchase intention.

3.4 Moderation of Customer Engagement

Customer engagement is a dynamic and ongoing interaction with a service, product, brand, or organization, encompassing psychological, physical, and emotional involvement (Brodie et al., 2011; Y. Kim et al., 2024; Letheren et al., 2019; Thakur, 2019). Letheren et al. (2019) explored household interactions with technology, identifying three primary engagement levels: passive, interactive, and proactive. At the passive level, engagement is linked to cognitive processes; at the interactive level, it involves behavioral actions; and at the proactive level, engagement encompasses emotional responses. At the proactive level, engagement is connected to emotional responses. The customer level of engagement with AI agents varies due to their ability to create a sense of presence and vivid sensory images through humanlike attributes. In this regard, Dev and Camp (2020) highlighted the effectiveness of humanlike conversation in chatbots, noting that it strengthens user engagement and nudges toward behavioral intentions.

Customer engagement may indeed strengthen the impact of immersive experience and perceived social presence generated by DAs on purchase intentions. When users are highly engaged, they tend to be more receptive to immersive, interactive experiences and are likely to value the sense of social presence DAs provide, thus increasing the likelihood of translating these experiences into purchasing behavior. The Customer Engagement Framework (Pansari & Kumar, 2017) suggests that highly engaged customers are more likely to exhibit trust and satisfaction in the products or services they buy or intend to buy. In the context of DAs, anthropomorphic attributes can enhance both trust and satisfaction by fostering a deeper sense of immersion and social presence, both of which encourage purchase intentions (Miao et al., 2022). Consequently, the direct effects of immersive experience and perceived social presence on purchase intentions are likely to be more pronounced among customers who are highly engaged. Therefore, the authors propose that:

H5a: Customer engagement positively and significantly moderates the relationship between immersive experience and purchase intention.

H5b: Customer engagement positively and significantly moderates the relationship between perceived social presence and purchase intention.

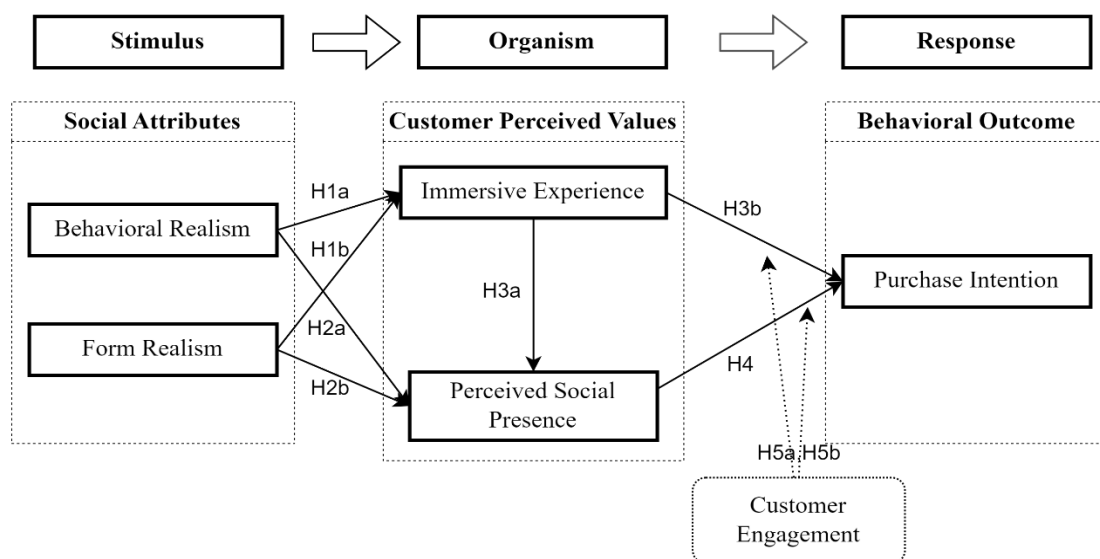


Figure 1. Proposed conceptual framework

3. METHODOLOGY

3.1 Study Context

Bangladesh offers a compelling context for this study for multiple reasons. *Firstly*, as an emerging nation aiming to transition out of its LDC status, Bangladesh has placed a strong emphasis on improving internet accessibility as part of its ‘Digital Bangladesh’ initiative (Saif, 2023). A report by Xinhua (2023) shows that Bangladesh currently has over 130.94 million internet users, featuring a substantial digital presence. Young people, who constitute 34% of the population, represent a large portion of this digital demographic (Deowan, 2020) and are promising online shoppers. While the use of digital assistants like Google Assistant, Siri, or Alexa is still emerging, there is growing interest in voice-based technologies, especially among younger, tech-savvy Bangladeshi users. From a contextual aspect, investigating Bangladesh, the world’s 9th largest mobile subscribers and internet users (BIDA, 2024), bridges a tremendous knowledge gap depicting the role of DAs in customer purchase intentions from an LDC perspective. *Secondly*, various industries (e.g., health, education, banking, etc.) have made strides in integrating AI into their operations. Research shows that people are increasingly adopting AI-driven technologies, such as ride-sharing services, Bangla natural language processing, chatbots, airfare and hotel booking platforms, and real-time mapping tools (Deowan, 2020). The AI market in Bangladesh is poised for remarkable expansion, with its size projected to surge from USD 1145 million in 2025 to USD 3906 million by 2030, driven by a robust CAGR of 27.82% (Statista, 2024a). Besides, a recent report by 6Wresearch (2025) shows that the chatbot market is anticipated to experience substantial growth, with a projected CAGR of 7.3% during the timeline from 2025 to 2031, reflecting its increasing adoption and transformative potential in this region. These advances highlight the potential for sizable growth in AI adoption to streamline consumers’ daily lives, making Bangladesh a suitable setting for exploring DA interactions and consumer behavior within an environment of rapid digital transformation.

3.2 Measures

This study adapted all the measurement scales (Table 2) from established sources. Scales for behavioral realism (4 items) and form realism (4 items) were drawn from I. Kim et al. (2024) and Sharma et al. (2022). The measures for customer-perceived value-related constructs, including immersive experience (3 items) and perceived social presence (3 items), were adapted from Dağ et al. (2023), Mimoun and Poncin (2015), and Sharma et al. (2022), respectively. Four items for purchase intention were derived from Guo and Luo (2023) and Sharma et al. (2022). Finally, consumer engagement (4 items) measures were adapted from Carvalho and Fernandes (2018) and Alalwan et al. (2020). The measures were anchored on a five-point Likert scale [strongly agree (5)–strongly disagree (1)].

Table 2. List of measures

Constructs	Items	Sources
Behavioral Realism	a) Sometimes my digital assistants seem to have real feelings	(I. Kim et al., 2024; Sharma et al., 2022)
	b) I can feel the interaction with my digital assistants as real	
	c) When I interact with my digital assistants, I feel there is a touch of sociability	
	d) When I interact with my digital assistants, I feel there is a sense of human sensitivity	
Form Realism	a) The digital assistants I interact with seem to have a humanlike appearance.	(I. Kim et al., 2024; Sharma et al., 2022)
	b) When I interact with my digital assistants, I feel like I am dealing with a real person	

	c) I can imagine the digital assistants to be a living creature	
	d) My interacted digital assistants have human features (e.g., gender, age, and accent).	
Immersive Experience	a) I feel like I am there while using the digital assistants	(Dağ et al., 2023)
	b) My interaction with my digital assistants is enjoyable	
	c) My interaction with my digital assistants is seamless	
Perceived Social Presence	a) The interaction with my digital assistants seems personal	(Mimoun & Poncin, 2015;
	b) The interaction with my digital assistants seems warm	Sharma et al., 2022)
	c) The interaction with my digital assistants seems close	
Customer Engagement	a) I am passionate about taking service from digital assistants	(Alalwan et al., 2020; Carvalho & Fernandes, 2018)
	b) I can continue using the digital assistants for very long periods	
	c) I feel enthusiastic when interacting with the digital assistants	
	d) I get absorbed when I interact with my digital assistants	
Purchase Intention	a) I will consider the assistance of the digital assistants when I want to purchase shortly	(Guo & Luo, 2023; Sharma et al., 2022)
	b) I am willing to buy the products or brands recommended by the digital assistants in the near future	
	c) I will ask my digital assistants to provide me with brand suggestions before I go shopping in the near future	
	d) I expect to continue using my digital assistants in the future	

3.3 Data Collection

The authors used a cross-sectional research design. Before the final survey, a pilot test was conducted with a sample size of 35 participants, including university professors, PhD candidates, masters/graduate students, and internet merchants. To refine the quality of the final questionnaire, the authors sought guidance from a panel of four experts - three professors with academic expertise in consumer behavior and human-computer interaction, as well as a marketing practitioner from an AI-driven marketing firm. Based on the expert opinions and pilot study, the final questionnaire was developed with minor adjustments to several scale items. The first segment of the questionnaire outlined the objectives of this research. To mitigate response bias, participants' identity and anonymity were ensured. Additionally, the authors refrained from requesting any contact information.

Data collection was conducted using an online survey, which has been extensively used in digital marketing and computer-human interaction-based research (Priya & Sharma, 2023; Sharma et al., 2022). Purposive sampling was used as the sampling frame based on the recommendation of Campbell et al. (2020). This is because the study's objectives align with the main theme of this sampling, making sure that the right sample is more suitably linked with the study's purpose (Campbell et al., 2020). The absence of a complete database for DA users (i.e., population) in Bangladesh motivated us to adopt this sampling approach. Potential respondents were approached both in person and online through social networking platforms like Facebook, WhatsApp, and LinkedIn, utilizing a Google Form link to facilitate data collection. Rather than focusing on any specific DAs, the survey began with an opening question asking respondents to select the DAs they knew and used most frequently. This sorting approach not only captured genuine familiarity and prior usage but also ensured that the survey engaged participants with meaningful and relevant experience in using DAs. Herein, two standards were set: a) sufficient knowledge and familiarity with DAs and b) used DAs in purchase decision-making. For ethical purposes, the authors only considered the respondents who were at least 18 years old. The online survey was conducted between November 2023 and January 2024.

To guarantee that the sample size was appropriate for the research constructs and scale items, the authors performed the G*Power analysis. This suggested a minimum sample size of 107, with an effect size of 0.15, a statistical power of 80%, and a significance threshold of 5% based on Hair Jr et al. (2021). After eliminating 24 incomplete and 14 zero-deviated responses, 352 responses were retained. This study's sample size exceeds the suggested requirements for sophisticated analysis, e.g., structural equation modeling (Kline, 2023). A descriptive analysis was performed using SPSS (version 23.0) to estimate respondents' demographics. As seen in Table 3, most of the participants were male (63.07%). Most participants were 26 to 35 years old (55.11%), engaged in government or private jobs (49.43%), had successfully obtained a graduation degree (46.59%), and had been using DAs (58.24%) for less than 2 years.

Table 3. Demographic details

Variables	Frequency (N)	Percent (%)
Gender		
Male	222	63.07
Female	130	36.93
Age (years)		
18-25	87	24.72
26-35	194	55.11
36-45	42	11.93
46-55	24	6.82
56 or above	5	1.42
Occupation		
Student	76	21.59
Government or private Jobs	174	49.43
Business	85	24.15
Others	17	4.83
Education Degree		
High school/College	15	4.26
Graduation	164	46.59
Post-Graduation	149	42.33
Others	24	6.82
Digital Assistant Usage Experience (Years)		
< 2	205	58.24
2 – 4	113	32.10
5 -7	28	7.95
8 or above	6	1.70
Total	352	100.00

3.4 Data Analysis Approach

For data analysis, SPSS software (version 23.0) was utilized to perform descriptive statistics. Inferential statistical analysis was conducted using partial least squares structural equation modeling (PLS-SEM) through SmartPLS 4.0 to assess the reliability and validity of both the measurement and structural models. The authors used PLS-SEM due to its more explanatory ability than covariance-based SEM (using AMOS) to investigate phenomena in their early stages of development (Fornell & Larcker, 1981). In this context, DAs' role in marketing and shaping customer choice is still new. Moreover, Hair et al. (2019) recommended PLS, particularly for the prediction-based models aiming to identify key predictor or driver constructs, which aligns with the research objectives of this study.

4. RESULTS

4.1 Measurement Model

The authors of this study assessed the reliability and validity of each construct of the measurement model using SmartPLS version 4.0. with bootstrapping (sample size of 5000). The subsequent section presents data normality, response bias, reliability, validity, and fit indices.

4.1.1 Normality tests

Data normality was examined based on the benchmark of Pearson's skewness and kurtosis values. Evidence shows skewness values between -2 and +2, and kurtosis values between -7 and +7 indicate data normality (Hair et al., 2012; Kline, 2023). In this study, skewness values ranged from -1.056 to -0.436, and kurtosis values ranged from -0.322 to 2.991, all within these acceptable thresholds, confirming that the data is normally distributed.

4.1.2 Common method variance (CMV)

CMV introduces survey response bias because each respondent answers both predictor and dependent variables simultaneously. This potentially leads to skewed results (Podsakoff et al., 2012). To address this concern, several steps (e.g., respondents' information anonymity and confidentiality) were implemented during the survey design and administration. The authors used Harman's single-factor evaluation of the common method bias (CMB) (Harman, 1976) and found that a single component explained 35.07% of the overall variation, which falls below the recommended criterion of 50%.

This study further employed the latent common factor (CLF) approach. Observed variables were allowed to load onto both their theoretical constructs and a CLF, following the method outlined by Podsakoff et al. (2003). Using AMOS version 23.0, the fit indices for the models with and without the CLF were calculated and then compared. The results showed that the fit indices of the CLF model ($\chi^2/df = 1.109$, RMSEA = 0.018, CFI = 0.995, NFI = 0.953, TLI = 0.993) were very similar to those of the model without the CLF ($\chi^2/df = 1.236$, RMSEA = 0.026, CFI = 0.988, NFI = 0.941, TLI = 0.986), indicating that CMB is not a significant issue in this analysis (Zhao et al., 2021). Additionally, the standardized regression weights for all items were contrasted across the two models (with and without the CLF). The differences were found to be minimal (<0.20), further confirming that CMB does not pose a major concern in this study (Gaskin, 2024; Serrano Archimi et al., 2018).

4.1.3 Reliability assessment

The model's reliability was assessed using composite reliability (CR) and Cronbach's alpha (see Table 4). The Cronbach's alpha values for the measured constructs are as follows: BR = 0.837, FR = 0.910, IME = 0.777, SP = 0.813, CE=0.806, PI = 0.831. Corresponding CR values are: BR = 0.891, FR = 0.937, IME = 0.871, SP = 0.889, CE=0.815, PI = 0.887. All values for each construct exceed the threshold of 0.70 (Nunnally & Bernstein, 1994), indicating that the model is reliable.

4.1.4 Convergent and discriminant validity

The convergent validity was measured using the average variance extracted (AVE) (see Table 4). Each construct's AVE exceeded the threshold of 0.5, with values ranging from 0.535 to 0.788, suggesting strong convergent validity (Hair Jr et al., 2021).

Subsequently, discriminant validity was assessed by applying the Fornell-Larcker criterion (Fornell & Larcker, 1981) and the heterotrait–monotrait ratio (HTMT). The results revealed that each construct’s square root of the AVE surpasses its correlations with other constructs (Table 5). Besides, the values of HTMT are below 0.85. Together, these outcomes substantiate the discriminant validity of the current model (Fornell & Larcker, 1981; Guo & Luo, 2023).

Table 4. Reliability and convergent validity of the measurement model

Constructs	Items	Factor Loadings	Mean	Standard Deviation	Cronbach’s alpha	Composite Reliability	AVE
Behavioral Realism (BR)	BR1	0.842	3.948	0.7416	0.837	0.891	0.672
	BR2	0.831	3.838	0.7314			
	BR3	0.785	3.795	0.7265			
	BR4	0.819	3.846	0.7035			
Form Realism (FR)	FR1	0.894	3.693	0.7217	0.910	0.937	0.788
	FR2	0.884	3.744	0.7220			
	FR3	0.894	3.772	0.7353			
	FR4	0.879	3.721	0.7095			
Immersive Experience (IME)	IME1	0.814	3.929	0.7342	0.777	0.871	0.692
	IME2	0.838	3.971	0.7467			
	IME3	0.843	3.977	0.7469			
Perceived Social Presence (SP)	PSP1	0.862	3.923	0.7059	0.813	0.889	0.728
	PSP2	0.881	3.954	0.6693			
	PSP3	0.814	4.028	0.6787			
Customer Engagement (CE)	CE1	0.568	3.718	0.8691	0.806	0.815	0.535
	CE2	0.642	3.951	0.8543			
	CE3	0.702	4.045	0.8726			
	CE4	0.954	3.698	0.8964			
Purchase Intention (PI)	PI1	0.831	3.935	0.6482	0.831	0.887	0.663
	PI2	0.851	3.950	0.6900			
	PI3	0.772	3.875	0.6804			
	PI4	0.801	3.864	0.6907			

Table 5. Discriminant validity

Fornell Larcker Criterion							HTMT Criterion					
	BR	CE	FR	IME	PI	SP	BR	CE	FR	IME	PI	PSP
BR	0.819						-					
CE	-0.063	0.731					0.071	-				
FR	0.379	-0.003	0.887				0.435	0.068	-			
IME	0.544	-0.034	0.323	0.832			0.669	0.063	0.382	-		
PI	0.581	-0.094	0.371	0.670	0.814		0.696	0.098	0.427	0.824	-	
SP	0.555	-0.097	0.398	0.635	0.684	0.853	0.672	0.136	0.459	0.7931	0.826	-

Note: Behavioral Realism (BR); Customer Engagement (CE); Form Realism (FR); Immersive Experience (IME); Purchase Intention (PI); Perceived Social Presence (PSP)

4.2 Structural Model

The next step comprises testing the structural model. In doing so, the authors considered key parameters, including variance inflation factor (VIF), R-square (R^2), Q-square (Q^2), F-square (F^2), and path coefficients, as recommended by (Henseler et al., 2015). The bias-corrected and accelerated (BCa) bootstrap method was used with 5000 bootstrapped samples to ensure robust estimates.

4.2.1 Multi collinearity

The authors checked for collinearity using the VIF test. Table 6 presents the outer model collinearity stats of the items. It shows that all of the VIF values are below the threshold of 3.3. Similarly, for the inner model, the maximum value was found to be 1.675, which also indicates that there is no significant multicollinearity issue in this analysis (Diamantopoulos & Siguaw, 2006).

Table 6. Collinearity stats

Outer	VIF	Inner	VIF
BR1	1.951	BR→IME	1.168
BR2	1.877	BR→PSP	1.520
BR3	1.697		
BR4	1.790		
FR1	2.902	FR→IME	1.168
FR2	2.710	FR→PSP	1.195
FR3	2.869		
FR4	2.568		
IME1	1.513	IME→PSP	1.454
IME2	1.723	IME→PI	1.675
IME3	1.627		
PSP1	1.886	PSP→PI	1.675
PSP2	1.956		
PSP3	1.624		
PI1	1.820		
PI2	2.008		
PI3	1.652		
PI4	1.720		

Note: Behavioral Realism (BR); Customer Engagement (CE); Form Realism (FR); Immersive Experience (IME); Purchase Intention (PI); Perceived Social Presence (PSP)

4.2.2 Measurement fits

Based on the guidelines of Henseler et al. (2015) and Hair et al. (2019), the standardized root mean square residual (SRMR) score was used to evaluate the model's goodness of fit. The SRMR value obtained for the estimated model was 0.056, which is below the threshold of 0.08. This indicates a good fit for the model.

The authors then assessed the R^2 values, which represent the proportion of variance explained by the model and serve as an indicator of overall model quality in PLS-SEM (Hair et al., 2019). As displayed in Table 8, the R^2 coefficients are greater than the recommended threshold of .10 (Hair et al., 2019). This suggests that the estimated model shows adequate explanatory power.

Specifically, the model accounts for 31 percent of the variance in immersive experience, 49 percent in social presence, and 58 percent in purchase intention.

The authors applied the blindfolding technique to evaluate Stone–Geisser’s Q^2 values, assessing the model’s predictive relevance. As shown in Table 8, the Q^2 values for immersive experience (0.301), perceived social presence (0.340), and purchase intention (0.340) exceed the benchmark of values above zero, indicating predictive relevance (Naala et al., 2017). These findings confirm that the constructs hold adequate predictive capacity within the model.

In addition, the Cohen F^2 effect size (Cohen, 1992) between variables was calculated (see Table 8). The F^2 scores for immersive experience with behavioral realism and form realism were 0.301 (medium) and 0.023 (weak), respectively. The F^2 score for social presence with immersive experience (0.267) indicates a medium effect size. However, social presence with behavioral realism (0.082) and form realism (0.041) represents a weak effect size. The effect sizes for purchase intention with immersive experience (0.200) and social presence (0.234) also reflect medium effect sizes, suggesting meaningful influences in these relationships.

4.2.3 Path coefficient estimation

Table 7 and Figure 2 present path coefficients, corresponding p-values and t-values, and hypotheses testing results. The findings suggest that H1a should be accepted since behavioral realism positively and significantly influences immersive experience ($\beta = 0.492$, $t = 7.117$, $p < 0.001$). H1b should also be accepted as behavioral realism significantly influences social presence ($\beta = 0.253$, $t = 4.724$, $p < 0.001$). Regarding H2a, form realism significantly influences immersive experience ($\beta = 0.137$, $t = 2.423$, $p < 0.05$); for H2b, form realism positively and significantly influences social presence ($\beta = 0.158$, $t = 3.429$, $p < 0.01$). In regard to H3a and H3b, immersive experience significantly influences social presence ($\beta = 0.446$, $t = 9.035$, $p < 0.001$) and purchase intention ($\beta = 0.379$, $t = 6.660$, $p < 0.001$). Confirming H4, social presence positively and significantly influences purchase intention ($\beta = 0.409$, $t = 6.994$, $p < 0.001$).

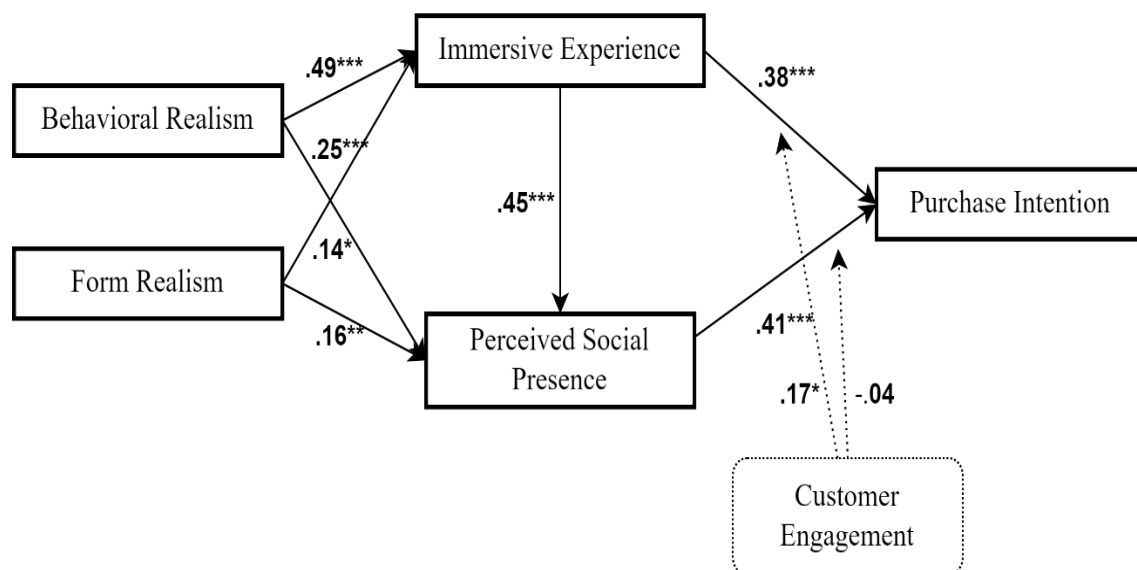


Figure 2. Structural model with hypothesis results.

[Notes: *** $p < 0.001$; ** $p < 0.01$; * $p < 0.05$; insignificant ($p > 0.05$). Moderating effects are shown in dashed lines.]

Table 7. Path coefficient values

Relationship	Hypothesis	Path coefficients	T statistics	P values	Hypothesis testing result
Behavioral Realism-Immersive Experience	H1a	0.492	7.117	0.000	Supported
Behavioral Realism- Perceived Social Presence	H1b	0.253	4.724	0.000	Supported
Form Realism - Immersive Experience	H2a	0.137	2.423	0.015	Supported
Form Realism - Perceived Social Presence	H2b	0.158	3.429	0.001	Supported
Immersive Experience - Perceived Social Presence	H3a	0.446	9.035	0.000	Supported
Immersive Experience - Purchase Intention	H3b	0.379	6.660	0.000	Supported
Perceived Social Presence - Purchase Intention	H4	0.409	6.994	0.000	Supported
Moderating Effects					
Customer Engagement - Purchase Intention	-	-0.047	0.719	0.472	-
Customer Engagement x Immersive Experience - Purchase Intention	H5a	0.169	2.041	0.041	Supported
Customer Engagement x Perceived Social Presence - Purchase Intention	H5b	-0.035	0.593	0.553	Not Supported

Table 8. Explanatory power

Predictors	Outcome (s)	R-Square (R^2)	Q-Square (Q^2)	F-Square (F^2)
Behavioral Realism	Immersive Experience	0.312	0.301	0.301
Form Realism				0.023
Immersive Experience				0.267
Behavioral Realism	Perceived Social Presence	0.487	0.340	0.082
Form Realism				0.041
Immersive Experience				0.200
Perceived Social Presence	Purchase Intention	0.582	0.340	0.234

4.3 Moderation Analysis

Figure 3 and Table 7 indicate that customer engagement positively moderates the relationship between immersive experience and purchase intention ($\beta = 0.169$, $t = 2.041$, $p < 0.05$), confirming H5a. It suggests that customer engagement in DAs strengthens the positive impact of immersive experiences on purchase intention. For H5b, the results show that customer engagement does not significantly moderate the relationship between social presence and purchase intention ($\beta = -0.035$, $t = 0.593$, $p > 0.05$), rejecting H5b.

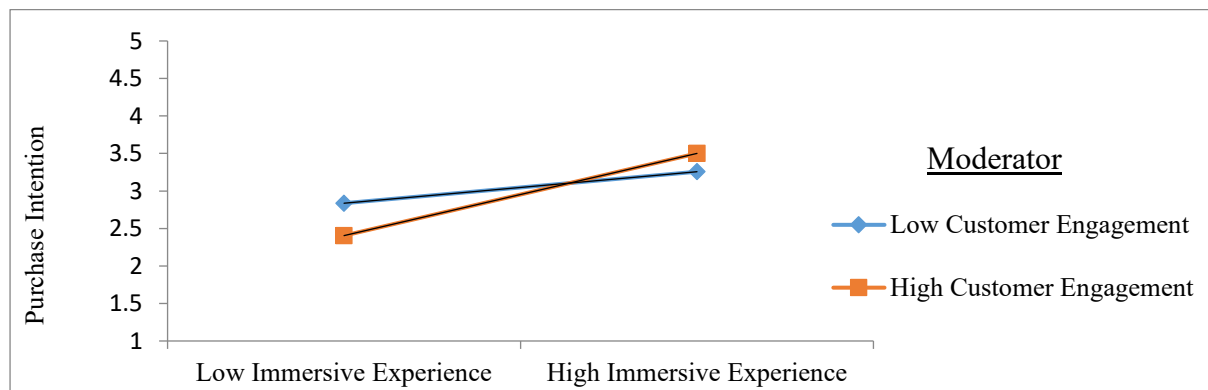


Figure 3. Moderating effects of customer engagement in the connection between immersive experience and purchase intention

5. DISCUSSION AND IMPLICATIONS

In recent years, people with high spending power are likely to redefine their consumption patterns; in return, companies have progressively intensified their investment in DAs. From the customers' perspective, there is a growing recognition of the efficiency DAs offer for shopping, often preferred over traditional methods. Bangladesh is rapidly evolving into a growing digital economy, being an LDC with the world's eighth-largest population (interchangeably used as prospects), it becomes imperative to understand their purchasing intentions via DAs. Using the SOR and the TCV, this study brings a fresh perspective to understanding the factors influencing customer purchase intentions, especially with the moderating role of customer engagement in this region. More specifically, the authors examined how DAs' social attributes - behavioral realism and form realism - shape customer-perceived social values, such as immersive experience and perceived social presence, and how these social values, in turn, affect customer purchase intentions. Extending the human-computer literature in an LDC context for the first time, the study's findings may be noteworthy for other LDCs and emerging economies. The following sections demonstrate the critical results of the study.

5.1 Discussion of the Key Findings

5.1.1 Behavioral realism → perceived social values (H1a and H1b)

The findings suggest that DAs' behavioral realism significantly amplifies and increases customer immersive experience (H1a) and perceived social presence (H1b). These findings hold particular importance in the context of Bangladesh, where internet usage and acceptance of smart devices are widespread. In recent years, there has been a noticeable rise in the average online time spent among Bangladeshi users, spurred by rapid technological advancements. Such a disruptive environment has led to a surge in utilizing DAs in daily routines, making the realistic, humanlike behaviors of DAs central to shaping customer perceptions (I. Kim et al., 2024). With cognitive and emotional behavior (e.g., gendered voice, friendly interaction, and efficient decision-making), DAs can easily evoke users' sense of immersion and social presence, engaging users deeply to feel natural and seamless interaction.

5.1.2 Form realism → perceived social values (H2a and H2b)

DAs' form realism positively and significantly influences customer immersive experience (H2a) and perceived social presence (H2b). These findings suggest that as DAs become more realistic and humanlike in terms of their attributes (e.g., name, gender, accent, cuteness, and age), the level of immersive experience and perceived social presence among users is likely to increase. This outcome aligns with Schindler and Bickart (2012), noting that higher levels of realism in immersive virtual experiences positively impact user experience. Similarly, Kim et al. (2018) discovered that the human embodiment of DAs impacts people's perception of social presence. Realistic DA attributes enhance trust and emotional bonding with customers, making interactions feel more genuine and fostering a deeper connection with technology.

5.1.3 Immersive experience → perceived social presence and purchase intention (H3a and H3b)

The findings further determine that customer immersive experience significantly increases their perceived social presence (H3a) and drives their purchase intentions (H3b). The results imply that the realistic attributes of DAs create a sense of ‘being there’ that reinforces customers’ sense of being present (perceived social presence). This, in turn, influences customer-perceived values (e.g., experience and satisfaction). For instance, when interactions with DAs are perceived as warm, friendly, empathetic, personal, intuitive, and seamless, customers feel more socially connected, mirroring the realistic social ties they experience in physical environments. Our findings are similar to Middleton (2005), who confirmed that users’ mental imagery via cutting-edge technologies (e.g., AI and ML) yields a heightened sense of presence. Besides, it was identified that the customer’s immersive experience is highly relevant to increasing purchase intentions, given that DAs can easily evoke customers’ credibility and reliability through anthropomorphic attributes. In response, customers feel safe and reliable in initiating behavioral outcomes (e.g., purchase intentions) (Pathak & Prakash, 2023).

5.1.4 Perceived social presence → purchase intention (H4)

This research concludes that perceived social presence evoked from DAs positively and significantly influences purchase intentions (H4). This finding is consistent with Sharma et al. (2022), who noted that DAs’ sense of warmth and sociability significantly influences customers’ purchase intentions. Previous research also highlights the strong influence of DAs’ humanlike interactions on customers (Li et al., 2021). Establishing a social presence is crucial for fostering a connection with users, shaping their attitudes, and influencing their intentions.

5.1.5 Moderation of customer engagement (H5a and H5b)

The results confirm that customer engagement positively moderates the relationship between immersive experience and purchase intentions (H5a). Customer engagement is crucial to strengthen customer immersive experiences to patronize their purchase intentions. The more customers engage with DAs, the deeper their attachment will be, leading to a sense of immersion. DAs’ engaging features (e.g., interactive elements, personalized recommendations, and responsive feedback) can deepen the user’s immersion and overall trust and satisfaction with the digital interaction. However, the findings revealed an insignificant moderating effect of customer engagement in the association between perceived social presence and purchase intentions (H5b). This might be attributable to the *Uncanny Valley Effects* (Sharma et al., 2022), wherein DAs’ form and behavioral realism are close to being humanlike but not fully convincing for many consumers. This subtle discrepancy may induce feelings of unease or discomfort in consumers, limiting the influence of customer engagement on the relationship between perceived social presence and purchase intentions.

5.2 Theoretical Implications

Drawing on the theoretical integration of SOR and TCV, the current research examined the effects of DAs’ social attributes on customers perceived social values, which subsequently trigger purchase intentions. Extending the moderating impact of customer engagement, this study adds new empirical evidence to the literature on DAs.

First, the merger of SOR (Mehrabian & Russell, 1974) and TCV (Sheth et al., 1991) significantly contributes to the validation of the recently proposed attribute-value-outcome-

based framework (Rahman et al., 2024) within DAs context. By conceptualizing DAs' anthropomorphic attributes as 'stimulus (S)', perceived social values (immersive experience and social presence) as 'organism (O)', and outcome (purchase intentions) as 'response (R)', this research advances an alternative sequential process - a three-phase interconnection - mirroring SOR, tailored explicitly for human-technology interaction. In this regard, TCV offers a value-centric perspective, providing theoretical justification for how DAs' attributes enhance perceived values, which subsequently drive consumer behavior - a primary objective for producers and marketers. Together, the integration of SOR and TCV lay the foundation of the attribute-value-outcome-based framework. Notably, this study is the first to empirically validate this framework, offering a robust model for understanding human-technology interactions and serving as a potential blueprint for future research in this domain.

Second, this study provides a comprehensive understanding of the relationship between social attributes and values within DAs literature. While prior research has extensively explored how various attributes of DAs, such as usefulness, ease of use, convenience, cost-effectiveness, and attractiveness, influence customer perceptions (Rahman et al., 2024), this study builds on and extends these findings. Aligning with and complementing earlier works (I. Kim et al., 2024; Miao et al., 2022), the present research emphasizes that customer perceptions are shaped not only by utilitarian, relational, and hedonic attributes of DAs but also by their interface-centered characteristics, specifically behavioral realism and form realism. Through this approach, the study provides empirical support for the Anthropomorphism Theory (Miao et al., 2022), highlighting the critical role of humanlike features in influencing customer perceptions and interactions with DAs.

Third, the current research delves into the less explored customer engagement as a moderator, shedding light on the Customer Engagement Framework (Pansari & Kumar, 2017). The results indicate that when customers heavily engage with various DAs, it substantially impacts the association between customer immersive experience and purchase intentions. The findings offer a new perspective in the DA literature, outlining that the fluctuation of customer engagement amplifies the blend of values and outcomes.

5.3 Practical Implications

The study's results offer valuable insights into how practitioners, designers, marketers, and platform providers can induce immersive experience and social presence derived from DAs' social attributes to accelerate customers' purchase intentions within an LDC context. The following discussion summarizes some crucial practical implications.

First, the results show that behavioral realism and form realism significantly generate positive immersive experiences and social presence. Therefore, designers should focus on enhancing DAs' behavioral realism by incorporating anthropomorphic features like gendered voices, personalized interaction styles, and empathetic responses. These elements can make interactions more natural and immersive, fostering trust and customer engagement. To improve customer satisfaction and social presence, DAs may incorporate visually appealing and culturally relevant features, such as localized accents, culturally significant names, and relatable aesthetics that resonate with local users.

Second, this research offers valuable insights into shaping customer-perceived social values (immersive experience and perceived social presence) and nudging toward purchase intentions. Companies can develop customer-centric retail marketing campaigns that highlight DAs'

immersive, interactive, and social presence features to attract younger, technology-savvy consumers, who are more likely to appreciate the advanced functionalities of DAs for shopping. Marketing campaigns should specifically emphasize product recommendations, seamless navigation, and responsive customer support capabilities, contributing to the perceived social presence evoked by DAs. For example, companies like Aarong and Pureit in Bangladesh can upgrade their messenger bots to AI-enabled DAs, whose tailored information and recommendations may reduce perceived costs when purchasing products online. Since social presence significantly influences purchase intentions, DAs can be integrated into social media and messaging platforms popular in Bangladesh, such as Facebook and WhatsApp, to facilitate social commerce.

Third, drawing on the findings relating to customer engagement as a moderator, this study recommends business strategies to encourage higher customer engagement with DAs. Initiatives like gamification, rewards programs, or interactive content can deepen customers' attachment to DAs, enhancing their immersive experience and likelihood of making purchases. However, developers should be cautious of the *uncanny valley* phenomenon by designing DAs that are humanlike but not overly realistic to avoid discomfort among users. A balance between realism and simplicity can make DAs more acceptable and engaging.

Finally, from the LDC perspective, this research opens a window to understanding how DAs can foster customer purchase intentions. In Bangladesh, the number of e-commerce users is projected to rise exponentially from 2024 to 2029, with a total increase of 15.2 million users (Statista, 2024b). Such growth dynamics create an opportunity for marketers and online service providers in LDCs to launch indigenous language-based DAs to increase customer adoption of DAs. In practice, AI-supported DAs can provide a coherent solution to an individual's local language (Alam et al., 2019).

6. LIMITATIONS AND FUTURE RESEARCH DIRECTIONS

This study has several limitations. *Firstly*, the study was based on Bangladeshi customers. It creates a concern for the generalizability of the results in other countries and regions. Future research should be extended to validate our proposed framework by testing it with other customers from diverse cultural backgrounds and nations. *Secondly*, our study solely focused on DAs' social attributes (i.e., behavioral and form realism) to show their effects on customer immersive experience and perceived social presence, which subsequently drive purchase intentions. Future research could explore additional attributes, such as functional attributes (e.g., convenience, responsiveness, and personalization) and emotional attributes (e.g., friendliness and playfulness), with relevant perceived values (functional and emotional) and their impact on customer purchase intentions. Also, the study acknowledges its limitation in the model's explanatory power, as indicated by an R^2 value of 0.582 (58.2%) for purchase intention. Additional variables could further enhance the explanatory strength of the model, presenting an opportunity for future research. *Thirdly*, conducting longitudinal or qualitative studies in future research would provide more profound and nuanced insights into consumer decision-making processes. *Finally*, the authors recommend integrating categorical variables (e.g., age, gender, use status, etc.) as moderators in future research to understand the relationship strengths between attributes, values, and outcomes.

7. CONCLUSION

This research unveiled the interrelationships between DAs' social attributes, perceived social values, and purchase intentions, considering the moderation of customer engagement within an

LDC perspective. These disruptive technologies have tremendous prospects in transforming the service-marketing landscape. Although this topic has become a focal point in contemporary discussions, the extant literature is scattered from a marketing perspective. Drawing on the SOR and TCV models, our study identified two crucial social attributes (i.e., behavioral and form realism) as key drivers of customers' perceived social values (i.e., immersive experience and social presence). It showed how these perceived values impact purchase intentions as behavioral outcomes. This research concluded that behavioral realism and form realism significantly impacted immersive experience and perceived social presence. This study also found a strong influence of immersive experience on perceived social presence. Moreover, customer engagement positively and significantly moderated the relationship between immersive experience and purchase intentions. Our study addressed the unexplored drivers and outcomes of customer-perceived social values and proposed a new attribute-value-outcome-based framework with DA and IS perspectives. In this process, perceived social values derived from the social attributional stimuli serve as critical predictors to enhance customer interaction with DAs and foster deeper engagement. Based on these factors, this study suggests strategic decision-making, calling businesses to design more personalized, interactive, and impactful customer-DA interaction experiences that may substantially drive their purchase intention in digital settings.

REFERENCES

- 6Wresearch. (2025). *Bangladesh Chatbot Market (2025-2031) | Industry, Companies, Outlook, Revenue, Analysis, Growth, Share, Size, Trends, Forecast & Value*. <https://www.6wresearch.com/industry-report/bangladesh-chatbot-market>
- Alalwan, A. A., Algharabat, R. S., Baabdullah, A. M., Rana, N. P., Qasem, Z., & Dwivedi, Y. K. (2020). Examining the impact of mobile interactivity on customer engagement in the context of mobile shopping. *Journal of Enterprise Information Management*, 33(3), 627-653.
- Alam, R. A., Islam, M. A., & Khan, A. (2019). Usage of Chatbot as a New Digital Communication Tool for Customer Support: A Case Study on Banglalink™. *Bangladeshi Case Study Series (Part 2)*.
- Alimamy, S., & Kuhail, M. A. (2023). I will be with you Alexa! The impact of intelligent virtual assistant's authenticity and personalization on user reusage intentions. *Computers in Human Behavior*, 143, 107711.
- Bailenson, J. N., Yee, N., Merget, D., & Schroeder, R. (2006). The effect of behavioral realism and form realism of real-time avatar faces on verbal disclosure, nonverbal disclosure, emotion recognition, and copresence in dyadic interaction. *Presence: Teleoperators and Virtual Environments*, 15(4), 359-372.
- Ben Saad, S. (2024). The digital revolution in the tourism industry: role of anthropomorphic virtual agent in digitalized hotel service. *International Journal of Contemporary Hospitality Management*.
- BIDA. (2024). *Bangladesh IT & ITes industry*. <https://bida.gov.bd/information-technology>
- Boian, R., Bucur, A.-M., Todea, D., Luca, A., Rebedea, T., & Podina, I. R. (2024). A conversational agent framework for mental health screening: Design, implementation, and usability. *Behaviour & Information Technology*, 1-15.
- Brill, T. M., Munoz, L., & Miller, R. J. (2022). Siri, Alexa, and other digital assistants: a study of customer satisfaction with artificial intelligence applications. In *The Role of Smart Technologies in Decision Making* (pp. 35-70). Routledge.
- Brodie, R. J., Hollebeek, L. D., Jurić, B., & Ilić, A. (2011). Customer engagement: Conceptual domain, fundamental propositions, and implications for research. *Journal of Service Research*, 14(3), 252-271.
- Buhalis, D., & Moldavska, I. (2022). Voice assistants in hospitality: using artificial intelligence for customer service. *Journal of Hospitality and Tourism Technology*, 13(3), 386-403.
- Campbell, S., Greenwood, M., Prior, S., Shearer, T., Walkem, K., Young, S., Bywaters, D., & Walker, K. (2020). Purposive sampling: complex or simple? Research case examples. *Journal of research in Nursing*, 25(8), 652-661.
- Candao, G. C., Herrando, C., & Hoyos, M. J. M.-D. (2023). Affective Interaction with Technology: The Role of Virtual Assistants in Interactive Marketing. In *The Palgrave Handbook of Interactive Marketing* (pp. 275-298). Springer.
- Carvalho, A., & Fernandes, T. (2018). Understanding customer brand engagement with virtual social communities: A comprehensive model of drivers, outcomes and moderators. *Journal of marketing theory and practice*, 26(1-2), 23-37.
- Cheney, A. W., McClannon, T., Bolt, L., & Sanders, R. L. (2019). Perceptions of presence and community in immersive online learning environments. In *Emerging Technologies in Virtual Learning Environments* (pp. 116-131). IGI Global.
- Cohen, J. (1992). Quantitative methods in psychology: A power primer. *Psychol. Bull.*, 112, 1155-1159.

- Dağ, K., Çavuşoğlu, S., & Durmaz, Y. (2023). The effect of immersive experience, user engagement and perceived authenticity on place satisfaction in the context of augmented reality. *Library Hi Tech*.
- Davis, F. D., Bagozzi, R. P., & Warshaw, P. R. (1989). User acceptance of computer technology: A comparison of two theoretical models. *Management science*, 35(8), 982-1003.
- Deowan, S. A. (2020). Artificial Intelligence: Bangladesh Perspective. *The Business Standard*. <https://www.tbsnews.net/tech/microsoft-says-it-caught-hackers-china-russia-and-iran-using-its-ai-tools-793046>
- Dev, J., & Camp, L. J. (2020). User engagement with chatbots: a discursive psychology approach. Proceedings of the 2nd Conference on Conversational User Interfaces,
- Diamantopoulos, A., & Siguaw, J. A. (2006). Formative versus reflective indicators in organizational measure development: A comparison and empirical illustration. *British journal of management*, 17(4), 263-282.
- Fakhimi, A., Garry, T., & Biggemann, S. (2023). The Effects of Anthropomorphised Virtual Conversational Assistants on Consumer Engagement and Trust During Service Encounters. *Australasian Marketing Journal*, 14413582231181140.
- Fernandes, T., & Oliveira, E. (2021). Understanding consumers' acceptance of automated technologies in service encounters: Drivers of digital voice assistants adoption. *Journal of Business Research*, 122, 180-191.
- Fornell, C., & Larcker, D. F. (1981). Evaluating structural equation models with unobservable variables and measurement error. *Journal of marketing research*, 18(1), 39-50.
- Gaskin, J. (2024). *Common latent factor*. [https://statwiki.gaskination.com/index.php?title=CFA#Common_Method_Bias_\(CM_B\)](https://statwiki.gaskination.com/index.php?title=CFA#Common_Method_Bias_(CM_B))
- Guo, W., & Luo, Q. (2023). Investigating the impact of intelligent personal assistants on the purchase intentions of Generation Z consumers: The moderating role of brand credibility. *Journal of Retailing and Consumer Services*, 73, 103353.
- Gutman, J. (1982). A means-end chain model based on consumer categorization processes. *Journal of Marketing*, 46(2), 60-72.
- Gwin, C. F., & Gwin, C. R. (2003). Product attributes model: A tool for evaluating brand positioning. *Journal of marketing theory and practice*, 11(2), 30-42.
- Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European business review*, 31(1), 2-24.
- Hair, J. F., Sarstedt, M., Ringle, C. M., & Mena, J. A. (2012). An assessment of the use of partial least squares structural equation modeling in marketing research. *Journal of the Academy of Marketing Science*, 40, 414-433.
- Hair Jr, J. F., Hult, G. T. M., Ringle, C. M., Sarstedt, M., Danks, N. P., Ray, S., Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2021). An introduction to structural equation modeling. *Partial least squares structural equation modeling (PLS-SEM) using R: a workbook*, 1-29.
- Hansen, A. H. (2014). *Memorable moments: Consumer immersion in nature-based tourist experiences*. University of Nordland.
- Harman, H. H. (1976). *Modern factor analysis*. University of Chicago press.
- Hauswald, J., Laurenzano, M. A., Zhang, Y., Li, C., Rovinski, A., Khurana, A., Dreslinski, R. G., Mudge, T., Petrucci, V., & Tang, L. (2015). Sirius: An open end-to-end voice and vision personal assistant and its implications for future warehouse scale computers. Proceedings of the Twentieth International Conference on Architectural Support for Programming Languages and Operating Systems,

- Henseler, J., Ringle, C. M., & Sarstedt, M. (2015). A new criterion for assessing discriminant validity in variance-based structural equation modeling. *Journal of the Academy of Marketing Science*, 43, 115-135.
- Hilken, T., Keeling, D. I., Chylinski, M., de Ruyter, K., Golf Papez, M., Heller, J., Mahr, D., & Alimamy, S. (2022). Disrupting marketing realities: A research agenda for investigating the psychological mechanisms of next-generation experiences with reality-enhancing technologies. *Psychology & Marketing*, 39(8), 1660-1671.
- Hudson, S., Matson-Barkat, S., Pallamin, N., & Jegou, G. (2019). With or without you? Interaction and immersion in a virtual reality experience. *Journal of Business Research*, 100, 459-468.
- Jin, E., & Eastin, M. (2024). Towards more trusted virtual physicians: the combinative effects of healthcare chatbot design cues and threat perception on health information trust. *Behaviour & Information Technology*, 1-14.
- Jun, H., & Bailenson, J. (2020). Effects of behavioral and anthropomorphic realism on social influence with virtual humans in AR. 2020 IEEE International Symposium on Mixed and Augmented Reality Adjunct (ISMAR-Adjunct),
- Kim, I., Ki, C.-W., Lee, H., & Kim, Y.-K. (2024). Virtual influencer marketing: Evaluating the influence of virtual influencers' form realism and behavioral realism on consumer ambivalence and marketing performance. *Journal of Business Research*, 176, 114611.
- Kim, J.-H., Kim, M., Park, M., & Yoo, J. (2023). Immersive interactive technologies and virtual shopping experiences: Differences in consumer perceptions between augmented reality (AR) and virtual reality (VR). *Telematics and Informatics*, 77, 101936.
- Kim, K., Boelling, L., Haesler, S., Bailenson, J., Bruder, G., & Welch, G. F. (2018). Does a digital assistant need a body? The influence of visual embodiment and social behavior on the perception of intelligent virtual agents in AR. 2018 IEEE International Symposium on Mixed and Augmented Reality (ISMAR),
- Kim, Y., Kang, Y., Kim, B., Kim, J., & Kim, G. H. (2024). Exploring the role of engagement and adherence in chatbot-based cognitive training for older adults: memory function and mental health outcomes. *Behaviour & Information Technology*, 1-13.
- Klein, K., & Martinez, L. F. (2023). The impact of anthropomorphism on customer satisfaction in chatbot commerce: an experimental study in the food sector. *Electronic commerce research*, 23(4), 2789-2825.
- Kline, R. B. (2023). *Principles and practice of structural equation modeling*. Guilford publications.
- Krämer, N. C. (2008). Social effects of virtual assistants. A review of empirical results with regard to communication. Intelligent Virtual Agents: 8th International Conference, IVA 2008, Tokyo, Japan, September 1-3, 2008. Proceedings 8,
- Lee, K. M., & Nass, C. (2003). Designing social presence of social actors in human computer interaction. Proceedings of the SIGCHI conference on Human factors in computing systems,
- Letheren, K., Russell-Bennett, R., Mulcahy, R. F., & McAndrew, R. (2019). Rules of (household) engagement: technology as manager, assistant and intern. *European Journal of Marketing*, 53(9), 1934-1961.
- Li, Q., Zhao, C., & Cheng, R. (2023). How the Characteristics of Live-Streaming Environment Affect Consumer Purchase Intention: The Mediating Role of Presence and Perceived Trust. *IEEE Access*.
- Li, W., Mao, Y., & Zhou, L. (2021). The impact of interactivity on user satisfaction in digital social reading: Social presence as a mediator. *International Journal of Human-Computer Interaction*, 37(17), 1636-1647.

- Maduku, D. K., Mpinganjira, M., Rana, N. P., Thusi, P., Ledikwe, A., & Mkhize, N. H.-b. (2023). Assessing customer passion, commitment, and word-of-mouth intentions in digital assistant usage: The moderating role of technology anxiety. *Journal of Retailing and Consumer Services*, 71, 103208.
- McLean, G., & Osei-Frimpong, K. (2019). Hey Alexa... examine the variables influencing the use of artificial intelligent in-home voice assistants. *Computers in Human Behavior*, 99, 28-37.
- Mehrabian, A., & Russell, J. A. (1974). *An approach to environmental psychology*. the MIT Press.
- Miao, F., Kozlenkova, I. V., Wang, H., Xie, T., & Palmatier, R. W. (2022). An emerging theory of avatar marketing. *Journal of Marketing*, 86(1), 67-90.
- Middleton, H. (2005). Creative thinking, values and design and technology education. *International journal of technology and design education*, 15, 61-71.
- Mimoun, M. S. B., & Poncin, I. (2015). A valued agent: How ECAs affect website customers' satisfaction and behaviors. *Journal of Retailing and Consumer Services*, 26, 70-82.
- Naala, M., Nordin, N., & Omar, W. (2017). Innovation capability and firm performance relationship: A study of pls-structural equation modeling (Pls-Sem). *International Journal of Organization & Business Excellence*, 2(1), 39-50.
- Nass, C., Steuer, J., & Tauber, E. R. (1994). Computers are social actors. Proceedings of the SIGCHI conference on Human factors in computing systems,
- Nowak, K. L., Fox, J., & Ranjit, Y. S. (2015). Inferences about avatars: Sexism, appropriateness, anthropomorphism, and the objectification of female virtual representations. *Journal of Computer-Mediated Communication*, 20(5), 554-569.
- Nunnally, J., & Bernstein, I. (1994). *Psychometric Theory* 3rd edition (MacGraw-Hill, New York). In.
- Pal, D., Roy, P., Arpnikanondt, C., & Thapliyal, H. (2022). The effect of trust and its antecedents towards determining users' behavioral intention with voice-based consumer electronic devices. *Heliyon*, 8(4).
- Pansari, A., & Kumar, V. (2017). Customer engagement: the construct, antecedents, and consequences. *Journal of the Academy of Marketing Science*, 45, 294-311.
- Parise, S., Guinan, P. J., & Kafka, R. (2016). Solving the crisis of immediacy: How digital technology can transform the customer experience. *Business Horizons*, 59(4), 411-420.
- Park, G., Yim, M. C., Chung, J., & Lee, S. (2023). Effect of AI chatbot empathy and identity disclosure on willingness to donate: the mediation of humanness and social presence. *Behaviour & Information Technology*, 42(12), 1998-2010.
- Park, M., & Yoo, J. (2020). Effects of perceived interactivity of augmented reality on consumer responses: A mental imagery perspective. *Journal of Retailing and Consumer Services*, 52, 101912.
- Partarakis, N., & Zabulis, X. (2024). A review of immersive technologies, knowledge representation, and AI for human-centered digital experiences. *Electronics*, 13(2), 269.
- Pathak, K., & Prakash, G. (2023). Exploring the role of augmented reality in purchase intention: Through flow and immersive experience. *Technological Forecasting and Social Change*, 196, 122833.
- Pelau, C., Dabija, D.-C., & Ene, I. (2021). What makes an AI device human-like? The role of interaction quality, empathy and perceived psychological anthropomorphic characteristics in the acceptance of artificial intelligence in the service industry. *Computers in Human Behavior*, 122, 106855.
- Podsakoff, P. M., MacKenzie, S. B., Lee, J.-Y., & Podsakoff, N. P. (2003). Common method biases in behavioral research: a critical review of the literature and recommended remedies. *Journal of applied psychology*, 88(5), 879.

- Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of method bias in social science research and recommendations on how to control it. *Annual review of psychology*, 63, 539-569.
- Polypartis, A., & Pahos, N. (2024). Understanding students' adoption of the ChatGPT chatbot in higher education: the role of anthropomorphism, trust, design novelty and institutional policy. *Behaviour & Information Technology*, 1-22.
- Priya, B., & Sharma, V. (2023). Exploring users' adoption intentions of intelligent virtual assistants in financial services: An anthropomorphic perspectives and socio-psychological perspectives. *Computers in Human Behavior*, 148, 107912.
- Rahman, M. S., Sabbir, M. M., Zhang, J., Taufique, K. M. R., & Rahman, M. M. (2024). Navigating Avatar-Based Marketing From Value Aspects: A Systematic Literature Review and Forward-Looking Research Agenda. *International Journal of Consumer Studies*, 48(6), e13096.
- Saif, A. (2023). Is voice technology driving Bangladesh's transition from digital to smart? *The Daily Star*. <https://www.thedailystar.net/business/economy/opinion/news/voice-technology-driving-bangladeshs-transition-digital-smart-3441521>
- Schindler, R. M., & Bickart, B. (2012). Perceived helpfulness of online consumer reviews: The role of message content and style. *Journal of Consumer Behaviour*, 11(3), 234-243.
- Scholz, J., & Smith, A. N. (2016). Augmented reality: Designing immersive experiences that maximize consumer engagement. *Business Horizons*, 59(2), 149-161.
- Serrano Archimi, C., Reynaud, E., Yasin, H. M., & Bhatti, Z. A. (2018). How perceived corporate social responsibility affects employee cynicism: The mediating role of organizational trust. *Journal of Business Ethics*, 151, 907-921.
- Sharma, A., & Sharma, S. (2023). Digital marketing adoption by small travel agencies: a comprehensive PLS-SEM model using reflective and higher-order formative constructs. *European Journal of Innovation Management*.
- Sharma, M., Joshi, S., Luthra, S., & Kumar, A. (2022). Impact of digital assistant attributes on millennials' purchasing intentions: A multi-group analysis using PLS-SEM, artificial neural network and fsQCA. *Information Systems Frontiers*, 1-24.
- Sheth, J. N., Newman, B. I., & Gross, B. L. (1991). Why we buy what we buy: A theory of consumption values. *Journal of Business Research*, 22(2), 159-170.
- Sindhu, P., & Bharti, K. (2024). Influence of chatbots on purchase intention in social commerce. *Behaviour & Information Technology*, 43(2), 331-352.
- Skalski, P., & Tamborini, R. (2007). The role of social presence in interactive agent-based persuasion. *Media psychology*, 10(3), 385-413.
- Song, M., Zhu, Y., Xing, X., & Du, J. (2023). The double-edged sword effect of chatbot anthropomorphism on customer acceptance intention: the mediating roles of perceived competence and privacy concerns. *Behaviour & Information Technology*, 1-23.
- Statista. (2024a). *Artificial Intelligence - Bangladesh*. <https://www.statista.com/outlook/tmo/artificial-intelligence/bangladesh>
- Statista. (2024b). *Number of users in the e-commerce market Bangladesh from 2019 to 2029*. Statista. <https://www.statista.com/forecasts/1436494/number-of-users-e-commerce-e-commerce-market-bangladesh>
- Thakur, N., & Han, C. Y. (2018). An approach to analyze the social acceptance of virtual assistants by elderly people. Proceedings of the 8th International Conference on the Internet of Things,
- Thakur, R. (2019). The moderating role of customer engagement experiences in customer satisfaction–loyalty relationship. *European Journal of Marketing*, 53(7), 1278-1310.
- Turner, S., Huang, C.-W., Burrows, L., & Turner, P. (2016). Make-believing virtual realities. *Digital make-believe*, 27-47.

- Venkatesh, V., Morris, M. G., Davis, G. B., & Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS quarterly*, 425-478.
- Whang, C., & Im, H. (2021). " I Like Your Suggestion!" the role of humanlikeness and parasocial relationship on the website versus voice shopper's perception of recommendations. *Psychology & Marketing*, 38(4), 581-595.
- Xinhua. (2023). Bangladeshi Internet users hit nearly 131 mln.
<https://english.news.cn/20230920/a49fac46fd734c9c92ab25ce2c3a7fe7/c.html>
- Yen, C., & Chiang, M.-C. (2021). Trust me, if you can: a study on the factors that influence consumers' purchase intention triggered by chatbots based on brain image evidence and self-reported assessments. *Behaviour & Information Technology*, 40(11), 1177-1194.
- Zhao, H., Zhou, Q., He, P., & Jiang, C. (2021). How and when does socially responsible HRM affect employees' organizational citizenship behaviors toward the environment? *Journal of Business Ethics*, 169, 371-385.