Why Do People Use Artificial Intelligence (AI)-Enabled Voice Assistants?

Suresh Malodia, Nazrul Islam, Puneet Kaur, and Amandeep Dhir

***Abstract*—Artificial-Intelligence-enabled voice assistants, such as Alexa and Siri, are increasingly replacing search engines as consumers actively employ the former to accomplish a variety of their day-to-day tasks. Technology providers as well as marketers increasingly work to leverage the use of voice assistants to engage their customers and offer them more personalized value propositions. This article examines the various consumption values associated with the use of voice assistants. Based on a theoretical framework rooted in the "theory of consumption values" (TCV), we undertake a mixed-methods approach that comprises interviews with experts ($n = 5$) and consumers ($n = 30$) as well as a cross-sectional survey with active users of voice assistants ($n = 371$). The article considers five consumption values—social identity, convenience, personification, perceived usefulness, and perceived playfulness—and two types of usage of voice assistants—information search and task function. Our findings contextualize and extend the TCV framework using voice assistant technology and obtain empirical support for the interrelation of consumption values. We find that social identity and personification have a strong positive association with both usefulness and playfulness. Furthermore, usefulness and playfulness are positively associated with information search and task function. In addition, trust and frequency of use significantly (and positively) moderate the association between usefulness and usage of voice assistants. Technology providers and marketers can capitalize on these findings to develop various voice-enabled applications and services that enhance the consumer experience and consumer engagement.**

***Index Terms*—Artificial Intelligence (AI), consumption values, frequency of use, theory of consumption value (TCV), trust, virtual assistants, voice assistant.**

I. Introduction

ARTIFICIAL Intelligence (AI) has become ubiquitous and integrated into consumers' day-to-day lives, fundamentally transforming customer interactions with stakeholders [1], [2]. Amidst a wide variety of AI-enabled virtual personal assistants, the growth of voice assistants (e.g., Alexa, Siri, and OK Google) has attracted the attention of marketers and technology providers who are increasingly interested in engaging with their existing and prospective consumers through the medium of voice.

Next to smartphones, voice assistants have recorded the fastest growth in the consumer technology segment and have transformed the ways humans interact with computers [3]. Accordingly, voice assistants have continuously evolved by adapting themselves to serve user needs most conveniently [4]. A voice assistant is an AI-enabled virtual assistant that uses natural language processing algorithms for speech synthesis and recognizes the user's voice to carry on complex conversations with the user in real-time [5]. Consumers employ voice assistants not only to conduct searches but also to complete tasks such as online shopping, ordering a cab, controlling their home automation systems, setting reminders, playing music, and listening to jokes [6], [7]. Stenvanovic [8] reported that there were nearly 3.25 billion active voice assistants in 2019 and predicted that this number will cross the 8 billion mark by 2023.

Given this unprecedented growth, voice assistants are expected to revolutionize consumers' interactions with various technology providers. However, the theoretical basis of this important practical phenomenon has received less attention. Scholars argue that the use of voice assistants is not limited to interactions aimed at executing search commands or completing tasks [9]. Instead, consumers tend to develop an emotional bond with their human-like voice assistants [9]. Although the use of voice assistants is steadily increasing, many consumers remain apprehensive about utilizing voice assistants in their day-to-day lives, citing security and privacy risks [10], [11]. Practitioners also suggest that despite the high rate of adoption and rapid surge in the number of voice-based interactions, the actual usage of voice assistants is low and limited to performing basic tasks, such as searching for information, controlling gadgets, and playing music [10].

Though academic attention is scant, practitioners have emphasized that technology providers and marketers can exploit the in-built support of voice assistants to handle consumers' complex search queries and thereby achieve their business objectives [12]. Thus, marketers strive to achieve voice assistant search engine optimization (SEO) and make brand, product, or service-related content searchable via the algorithms employed by voice search engines [12]. Similarly, Klaus and Zaichkowsky [13] suggested that, retailers are competing to integrate voice assistants with their websites and mobile applications in order to attract consumers who are adopting voice assistants for their

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shopping needs. The academic literature examining consumer-behavior-related issues involving voice assistants is currently limited, and in fact, very few empirical studies exist on this subject [5]. Kaplan and Haenlein [14] explored and discussed the various applications of voice assistants, while Smith [6] proposed different content creation strategies for marketing via voice assistants.

A potential complement to this limited body of research, empirical studies examining the consumption values related to the use of voice assistants are almost nonexistent. Currently, scholars do not know why consumers utilize voice assistants or, in other words, what consumption values drive consumers' use of voice assistants. The current article aims to bridge this gap in the extant literature by answering the following research questions:

1) What consumption values are associated with voice assistants, and how do these consumption values influence the types of voice assistant usage (e.g., information search and task function)?
2) How are the different consumption values in the context of voice assistants related to each other?
3) Do moderators, such as frequency of usage and trust in voice assistants, moderate the strength of the relationship between consumption values and types of usage?

Understanding consumption values in the context of voice assistants is a critical research agenda with both theoretical and practical implications, and hence, these questions must be addressed.

We draw on the theory of consumption values (TCV) [15] to develop and test the research model via a mixed-methods approach, which consists of a qualitative ($n = 35$) and a quantitative study ($n = 371$). TCV offers only generic consumption values; thus, we utilize a qualitative study to map the generic consumption values to the voice-assistant-specific consumption values as suggested by the recent literature [16], [17]. Then, we answer the different research questions by evaluating the developed model using a cross-sectional research design consisting of 371 voice assistant users.

By first theorizing and later empirically validating the extended consumption values in the context of voice assistant usage, this article offers crucial insights on the motivations associated with the use of voice assistants and contributes significantly to the literature on consumption values. The research findings offer a thorough understanding of how and why consumers use voice assistants, and what value they derive from using voice assistants.

This article makes several contributions. First, it empirically extents the generic consumption values and broadens our understanding of the consumption values in the context of voice assistants, a new technology that is highly interactive. Second, it not only contextualizes and extends the TCV framework [15] for voice assistants technology perspectives but also provides empirical support for the notion that consumption values are not at the same level but are, instead, interrelated. Third, we find that personification has a strong positive association with both perceived usefulness and perceived playfulness. This further strengthens the typology of relationships that consumers build with their voice assistants [9], [18]. Fourth, this article observes that perceived playfulness has a significant association not only with information search but also with task function, which corroborates the findings of Martin *et al.* [19] and Venkatesh *et al.* [20] that hedonic benefits significantly influence the choices consumers make when adopting new technology [21]. Manufacturers, technology providers, and marketers can capitalize on these findings to develop various voice-enabled applications and services to enhance the consumer experience and consumer engagement.

The rest of this article is organized as follows. Section II provides a review of the extant literature discussing the relevant hypotheses and conceptual framework. Section III explains the empirical results, while Section IV presents the managerial and theoretical implications. Finally, the concluding section discusses the article's limitations along with future research directions.

II. Literature Review

A. Voice Assistants

The human desire to engage in conversation with computers has been exemplified in science fiction movies starting with *Space Odyssey*, which was released in 1968, to the 2013 movie *Her*, which presented the unique story of a man falling in love with Samantha, a new operating system [5], [22]. In the real world, we recognize Samantha in devices named "Alexa" and "Siri." Such software-controlling voice assistants remain continuously in listening mode, awaiting a keyword from their users to "wake up" [4]. Upon hearing the keyword, the assistant begins recording the user's voice, which it transmits to the main server. After processing the voice message using natural language processing and machine learning algorithms, the server responds to the user's command and transmits the reply to the voice assistant, which plays it back for the user [5]. This communication process enables consumers to engage in natural conversation with their voice assistants [9]. Table I identifies the dominant voice assistants currently available on the market and describes their key functions.

Because they can handle consumers' complex search queries, voice assistants are increasingly replacing conventional search engines [6]. For example, consumers can use voice assistants to search for "the best smartwatch brand under $50 (USD)" or ask, "Which is the best organic honey on the market?" A growing number of studies have also suggested that consumers are using voice assistants to place online shopping orders [13].

In recent years, in fact, a paradigm shift has occurred in consumers' use of voice assistants to shop online [13]. Three main phenomenological observations are as follows:

1) Consumers are increasingly using product attributes or product benefits as search criteria—e.g., they employ search terms such as *organic honey* and *hand-crafted silk scarf* [23].
2) Consumer interaction is shifting from searching directly for brands to asking their voice assistants questions about brands. Information answering these questions is retrieved

TABLE I
DETAILS OF VARIOUS VOICE ASSISTANTS

			Functions performed by voice assistant											
Voice assistant	**Owner**	**No. of users**	1	2	3	4	5	6	7	8	9	10	11	12
Alexa	Amazon	>100 million	√	√	√	√	√	√	√	√	√	√	√	√
Siri	Apple	375 million	√	√			√	√	√	√	√	√	√	√
OK Google	Google	500 million	√	√	√	√	√	√	√	√	√	√	√	
Cortona	Microsoft	800 million	√	√			√	√			√			
Bixby	Samsung	>10 million	√	√	√	√	√				√			
HelloJio	Jio*	N/A	√	√		√	√	√			√			
Nina	Nuance**	N/A	√		√			√	√				√	
AliGenie	Alibaba	500 million	√	√	√		√	√		√	√		√	

1—search, 2—texting and email, 3—shopping, 4—customer support, 5—updates (news, weather, etc.), 6—play music, 7—traffic navigation, 8—control other devices, 9—set reminders and alarms, 10—play games, 11—make payments, 12—tell a story or a joke.
*This is available on the MyJio app, which has over 100 million downloads.
**50000 downloads (data are not available online regarding the active number of users).

by the voice assistants' respective algorithms, which ultimately influence consumer purchase decision-making.

3) Consumer choices are shifting from visual stimuli to audio stimuli from their voice assistants.

Some studies in the extant literature have attempted to explore the psychological dimensions of consumers' decision-making in the context of AI and the ways in which AI-based disruptive technologies, such as voice assistants, are influencing consumer choices [5], [6]. However, scholars have yet to determine the consumption values consumers seek when using voice assistants to complete actions such as searching for information and performing various tasks. A better understanding of consumption values specific to voice assistants will be useful for marketers to develop and redesign consumer interactions with voice assistants and offer superior value propositions to their existing and prospective consumers. The current article, which utilizes the TCV framework as an overarching theoretical framework in the context of voice assistants, aims to address this gap.

B. Technology Adoption Literature

The technology acceptance model (TAM) has sought to explain the adoption and use of new technology across various domains. Though TAM offers an overly simplified explanation of the drivers of consumers' behavioral intentions to adopt a new technology, it is criticized for its inability to explain the actual usage of such technology. In fact, consumers' behavioral intentions often do not converge into actual behavior, and hence, TAM is criticized for failing to predict actual use behavior [24]. The unified theory of acceptance and use of technology (UTAUT) is a modified version of TAM. Aiming to address the limitations of the initial model, the UTAUT claims to explain the ongoing use of technology. Nevertheless, the UTAUT, which is grounded not only in TAM but also in the theory of reasoned action, the theory of planned behavior, social cognitive theory, and the diffusion of innovations model, has been criticized for numerous shortcomings. Bagozzi [25] criticized UTAUT for being too complex and chaotic. Similarly, Van Raaij and Schepers [26] further evaluated the model, concluding that it was less parsimonious than the TAM and noting that the explained variance was significant only when the four moderators were included in the model.

In addition, it is crucial to understand that consumers perceive voice assistants as more than merely technological devices and that they interact with their devices in a conversational manner. Unfortunately, the existing theoretical models offer little insight on this dimension. Furthermore, in the context of voice assistants, the adoption of technology is a given, as consumers readily interact with technology [27]. Voice assistants are a type of companion to consumers, and hence, to design effective voice applications, brands must understand the ways in which consumers choose to interact with their voice assistants on a routine basis and the factors that determine their usage. Thus, TCV, which is based on actual technology usage, is a valuable theoretical framework to advance our understanding of this new domain.

C. Theory of Consumption Values

The TCV can be employed as a theoretical paradigm to understand consumers' consumption and use of new technologies and innovations [17]. According to TCV, a consumer's decision to adopt and use technology is a voluntary choice based on the *perceived consumption value* associated with the use of a selected product, brand, or service [15]–[17]. TCV combines both intrinsic and extrinsic behavioral dimensions that drive the consumption decision, i.e., to use or not to use a product or service, how much to use and when to use a product or a

TABLE II
MAPPING OF GENERIC VALUES AND EXTENDED VALUES OF TCV

Generic value	Proposition	Extended value	Proposition
Functional value	The value is derived from the utilitarian attributes of a product (functional or physical) [15].	**Perceived usefulness**	The extent to which consumers perceive voice assistants to be useful enhances the value consumers derive by using their voice assistants.
Emotional value	The value is derived from the ability of a product to arouse feelings [15].	**Personification**	The extent to which personifying voice assistants arouse emotions among consumers of voice assistants.
Social value	The value is derived from the association of a product with social imagery and the ability of the product to boost self-image [15].	**Social identity**	The extent to which using voice assistants helps consumers to affirm their social identity.
Epistemic value	The value is derived from the ability of a product to entice inquisitiveness, offer uniqueness or satisfy the pursuit of knowledge [15].	**Perceived playfulness**	The extent to which consumers perceive using voice assistants to be playful and enjoyable.
Conditional value	The value is derived from a product in the context of a set of circumstances [15].	**Convenience**	The extent to which using voice assistant creates convenience for users under specific conditions.

service [28], [29]. Sheth *et al.* [15] argue that TCV is axiomatic because it can be applied in multiple contexts and has been validated across 200 product categories. In the context of voice assistants, the TCV framework is relevant because it is not limited solely to purchase decisions. Thus, it can provide insights about consumers' decisions to regularly engage (or not) with their voice assistants. Furthermore, because it has been validated in the context of microcomputers, video recording devices [15], and IT/digital artifacts [30], such as social media and navigation devices [28], TCV can be useful in the context of technology products, such as voice assistants. Despite the extended body of prior TCV literature, however, to the best of our knowledge, no study has yet examined consumption values in the context of voice assistants.

III. EXTENDING TCV CONSUMPTION VALUES FROM THE VOICE ASSISTANT PERSPECTIVE

The recent literature on TCV favors using context-specific measures rather than generic measures to understand the ways in which consumption values vary in the context of products and services [16], [17]. Scholars have emphasized that TCV offers a framework for contextualizing generic values in specific contexts for an enhanced understanding of the values consumers derive from products and services [16], [17]. Therefore, we contextualize the generic consumption values by understanding the specific values that consumers derive from the use of voice assistants (Table II). TCV offers three major propositions. These are as follows:

1) Adoption of a new product or technology is a function of five consumption values [15].
2) Each consumption value has a differential contribution [15].
3) The consumption values are not independent of each other; instead, they are interdependent as suggested by the recent literature [17].

A. Qualitative Study

We utilized qualitative research to identify context-specific consumption values. Qualitative research included in-depth interviews (with 5 experts and 30 consumers) and content analysis of popular online information sources. First, we interviewed five experts: three of these experts were working in the industry at senior positions handling strategic business units related to voice assistants, while the other two experts were senior researchers who had published extensively in the areas of digital technology and digital marketing. The experts were asked the following questions:

1) What are the primary and secondary needs of consumers based on the existing use cases of voice assistants?
2) How is the adoption of voice assistants evolving?
3) How are consumers using voice assistants for making purchase decisions?
4) What opportunities can voice assistants provide to technology providers and brands?
5) What concerns are involved in the adoption of voice assistant users?

The industry experts helped us to identify the factors related to the use of voice assistants from the industry perspective. Their insights also informed our efforts to design an interview schedule for the consumers.

In the next step, we interviewed 30 existing consumers of various voice assistants. The interviewees (17 males and 13 females between 19 and 53 years of age) had been using voice assistants for at least six months. To obtain an in-depth understanding of their usage of voice assistants, the interviews adopted an

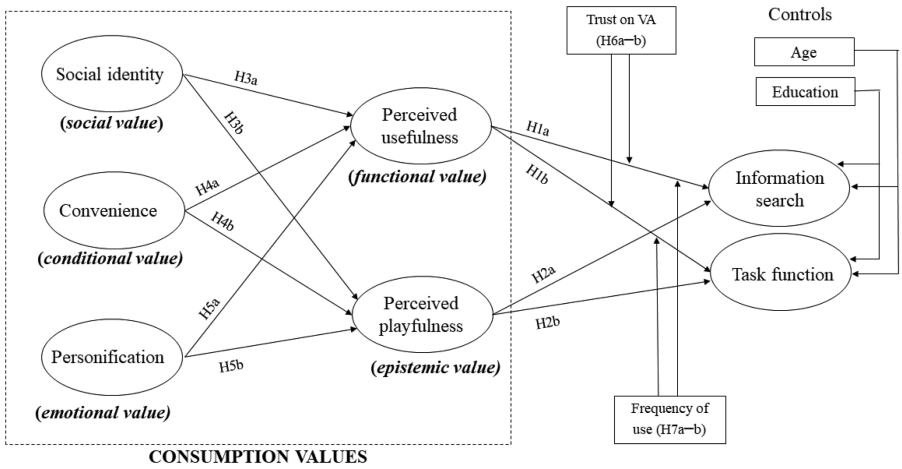

Fig. 1. Research framework.

aided recall strategy. The participants were given multiple usage scenarios (e.g., booking a cab, controlling IoT devices, getting news updates, ordering online, playing music, and searching the Internet) as stimuli to recall their past usage and share their experiences using voice assistants. We asked questions regarding various occasions, durations, frequencies, and types of use as well as the perceived benefits the interviewees associated with using voice assistants. The qualitative data were analyzed using an affinity mapping technique, and recurring themes were identified as suggested by other scholars [16]. Affinity mapping is a data analysis technique used with qualitative data [18]. We employed a team of four research associates to conduct affinity mapping by arranging research observations on sticky notes on a soft board. Next, the notes were grouped to identify themes. This process identified the following themes: 1) easy to use, 2) convenient, 3) faster, 4) personalized, 5) saves time, 6) part of a lifestyle, 7) fun and enjoyment, 8) practical utility, and 9) beneficial.

After the interviews, we conducted a qualitative content analysis of popular online news articles, marketing blogs, and consumer reviews on Amazon Alexa and Amazon Echo published between 2018 and 2020 about different voice assistants to understand the major sentiments related to different values consumers derive from their voice assistants. The qualitative content analysis of 12 articles and 80 consumer reviews further strengthened the themes identified via the consumer interviews. A panel of academic experts (two professors and two research associates) with expertise in qualitative research techniques along with one industry expert with expertise in voice assistants reviewed the first pool of research themes. The panel suggested combining similar themes and dropping redundant themes; based on their insights, we organized the remaining themes into relevant consumption values. The raters achieved sufficient intercoder reliability as measured using Cohen's kappa.

The final pool of themes was mapped with the prior TCV literature to link the context-specific consumption values associated with the use of voice assistants to the generic TCV proposed by other scholars. The final set of consumption values were "perceived usefulness" (generic value—functional value), "social identity" (generic value—social value), "personification" (generic value—emotional value), "perceived playfulness" (generic value—epistemic value), and "convenience" (generic value—conditional value; Table II). The qualitative data suggested that trust and frequency of use are the two variables that influence the consumption values and usage of voice assistants. Therefore, the current article examined their moderating role in the studied associations.

IV. Research Framework and Hypotheses

The research framework (Fig. 1) includes the five consumption values as latent constructs and two dependent variables, namely, information-seeking behavior and task behavior. The consumption values are assumed to be hierarchical such that social value, conditional value, and emotional value lead to functional and epistemic value. The research model also examines the moderating role of frequency of use and trust in voice assistants while controlling for consumers' age and education.

A. Perceived Usefulness (Functional Value)

The prior research discussed the significance of functional value in predicting consumers' behavioral intentions and behavioral use of new-age technology products and services [16], [31], [32]. Functional value is the perceived utility the consumer derives from different attributes of a product or service and is characterized as the perceived utilitarian value or simply the perceived usefulness [15], [33]. Functionality has been identified as an important benefit that consumers seek from using smart speakers [34], [35]. The scholarly research examining the adoption of AI-based products shows that perceived usefulness significantly influences the adoption and usage of AI-enabled devices, such as virtual personal assistants [1], [36], [37]. Moriuchi [1] found that perceived usefulness positively influences users' engagement with Google Assistant for transactional as well as nontransactional activities. Consumers utilize voice assistants for multiple purposes, including searching for information, asking questions, and completing tasks, such as controlling their

IoT devices, booking a taxi via Uber, placing orders online, and making payments. Hence, we advance the following hypotheses:

H1a: Perceived usefulness is positively associated with information search in the context of voice assistants.

H1b: Perceived usefulness is positively associated with task function in the context of voice assistants.

B. Perceived Playfulness (Epistemic Value)

The extant research has suggested that epistemic value, i.e., consumers' desire to explore new technologies and learn new practices, significantly influences their use of new technology, such as mobile apps, virtual products in online games, hyped technology artifacts, etc. [16], [32], [38]. Consumers derive epistemic value by using products that have the ability to arouse curiosity or offer pleasurable experiences because of their unique attributes [15]. Identifying perceived playfulness as an individual's curiosity, Park and Lee [39] observed its strong association with consumers' purchase intentions. The existing literature characterizes playfulness as the tendency of consumers to interact instinctively and innovatively with new technology [40]. Yang *et al.* [41] identified playfulness as an important component of value in the context of wearable devices, and Kowalczuk [36] found that perceived enjoyment in the context of smart speakers was significantly associated with consumers' behavioral intentions. The attribute of playfulness has utilitarian benefits and acts as a motivational force influencing the usage behavior [42]. If consumers feel good about interacting with their voice assistants, they will be intrinsically motivated to use them more frequently and are likely to experience a higher degree of engagement. Because voice assistants are capable of carrying on asynchronous conversations, consumers playfully use them both to conduct searches and to complete various tasks. Therefore, we advance the following hypotheses:

H2a: Perceived playfulness is positively associated with information search in the context of voice assistants.

H2b: Perceived playfulness is positively associated with task function in the context of voice assistants.

C. Social Identity (Social Value)

Social identity is a psychological state that individuals use to collectively represent who they are and where they belong by associating themselves with certain social groups [43]. Scholars have argued that consumers derive value from their social identity and that their perceived membership in social groups is emotionally significant to them [44]. Social identity motives, such as enhancing self-expression, self-image, and self-esteem, have been advocated as key factors for developing strong associations between consumers and technology providers [43].

The literature suggests that a substantial number of social identity motives are embedded in innovative products and services, such as smartphones, AI-enabled products, mobile apps, and digital artifacts [30], [45]. According to Turel *et al.* [30], using digital artifacts enables consumers to identify themselves as sophisticated or trendy and, hence, provides significant social value. Bødker *et al.* [45] argued that consumers use the newest smartphone, such as the iPhone, to identify themselves with certain social strata. Similarly, Ogbanufe and Gerhart [46] asserted that consumers purchase smartwatches to affirm their social identity and that this desire to affirm their social identity enhances their purchase intentions [47]. Furthermore, Talwar *et al.* [16] found that consumers use mobile apps not only because this behavior stimulates social approval but also because it helps users to build a strong positive image. Hence, we argue that social identity is a powerful driver of social value.

Social identity affects the ways in which consumers perceive and evaluate various offerings both cognitively as well as emotionally, and these perceptions and evaluations further shape consumers' behavior by influencing their attitudes and beliefs [48], [49]. Scholars have argued that value perceptions become intensified in consumers' minds when a particular product or a service can reinforce their self-identity, and hence, consumers perceive such products as more useful [50]. Similarly, amidst the rapid evolution of social media and the virtual digital environment, consumers not only seek identity expressiveness but also fun and enjoyable experiences [51]. For example, consumers exhibit playfulness by selecting various avatars to express their social identity while also playing online games to experience fun and entertainment [52]. Therefore, social identity has a positive effect on both perceived usefulness and perceived playfulness. Based on the above arguments, we propose the following hypotheses:

H3a: Social identity is positively associated with perceived usefulness.

H3b: Social identity is positively associated with perceived playfulness.

D. Convenience (Conditional Value)

Conditional value, which is acquired in a specific context, location, or time, refers to the perceived utility of a product or service [16]. For example, consumers use GoPro cameras to capture adventurous moments, such as bungee jumping or scuba diving. Similarly, some products are relevant only during festive seasons, while other products are subtly associated with specific scenarios, such as drinking beer while enjoying a football game [28]. Studies related to consumption values in the context of digital gadgets identify "convenience" as an important conditional value that consumers seek while using a product [45]. Petrovčiková and Sudzina [32] also adopt convenience as a measure of conditional value and postulate that the ability to transmit location-based data over a smartphone is an important condition to increase the utility of location-based services. In the context of voice assistants, the user's location may influence his or her decision to use a voice assistant. For example, a user may wish to turn ON his or her air conditioner remotely or arm the door of his or her house while sitting on the terrace. Similarly, a user may perceive a voice assistant to be useful while he or she is engaged in a particular combination of activities, such as using a voice assistant while driving to connect calls or search information [53]. Voice assistants perform functions that allow consumers not only to save time but also to complete tasks conveniently under specific conditions. This convenience in the

context of specific activities, situations, or locations influences the use of voice assistants and, hence, can be employed to represent conditional value in the context of voice assistants.

Chang *et al.* [54] argued that time, place, and execution convenience significantly reduce consumers' cognitive and affective efforts, thereby enhancing their efficiency and enabling them to feel the "flow" [55]. With increased efficiency, consumers tend to experiment to a greater extent, which increases their enjoyment and playfulness [56]. Convenience in the context of voice assistants not only allows users to complete a wide range of tasks at any time and in a hands-free manner, but with simple voice commands allowing them to multitask, it also offer flexibility and allows consumers to be experimental and playful. Hence, we propose the following hypotheses:

H4a: Convenience is likely to have a positive effect on perceived usefulness.

H4b: Convenience is likely to have a positive effect on perceived playfulness.

E. Personification (Emotional Value)

Emotional value refers to the ability of a product or service to evoke feelings and emotions [15]. Consumers are often emotionally attached to their possessions and derive emotional value by personifying such products [57]. The literature confirms that information technology gadgets arouse emotions, and consumers become emotionally attached to their personified digital assistants as virtual partners or pseudo girlfriends/boyfriends [57]. Unlike other technological devices, voice assistants are conversational agents, and hence, users personify them with human-like traits [58]. Boonrod and Ketavan [22] reported that consumers share an emotional bond with their voice assistants because this bond fulfills their hedonic desire to feel like they are communicating with a human being while interacting with their voice assistants. The current article measures personification (a form of emotional value), which refers to the attribution of human-like qualities and characteristics to nonhuman agents and voice assistants [59].

Scholars have suggested a positive association between personification and both usefulness and playfulness. Pradhan *et al.* [60] found that older users' interactions with their voice assistants are positively associated with their personification of those assistants. Schweitzer *et al.* [9] explored the typology of relationships consumers build with their personified voice-enabled devices. Their article argued that consumers personify their voice assistants either as a friend, partner, servant, or master. When they personify their assistants as a friend or a partner, consumers associate the assistants with fun, playfulness, and the accomplishment of social interaction tasks [9]. In contrast, when they personify their voice assistants as a servant, consumers perceive the assistants as useful and interact with them to derive utilitarian values [9]. Based on the aforementioned discussion, personification is thus likely to be positively associated with the playfulness and usefulness of voice assistants. Therefore, we advance the following hypotheses:

H5a: Personification is positively associated with perceived usefulness.

H5b: Personification is positively associated with perceived playfulness.

F. Moderators

Identifying and validating moderators enhances our understanding of the boundary conditions and individual differences observed in consumer behavior [61]. A review of the prior literature reveals that trust remains a primary concern among users of AI-based smart devices [62]. Wells *et al.* [63] found that consumers' trust in smart speakers is relatively low compared to their trust in other technological devices, such as computers and smartphones. The literature identifies trust as an enabler of user engagement [64]. Similarly, studies have observed that a lack of trust results in the user's aversion [65]. While the adoption and usage of voice assistants are increasing at unprecedented rates, consumers also remain skeptical about voice assistants [66]. Consumers perceive voice assistants as intrusive, and security concerns leave approximately one-third of users uncomfortable with sharing their financial and personal details with voice assistants [10]. Our qualitative study also found that consumers fear that searching for information about products and brands through voice assistants may cause them to receive unnecessary marketing calls. Consumers who trusted their voice assistants, however, believed that their search information would not be employed for commercial purposes, and such consumers extensively used their voice assistants to search for information. Based on the above literature and our qualitative interviews, we propose that trust in voice assistants will influence voice assistant usage. Therefore, we test the following hypotheses:

H6a–b: Trust will positively moderate the association (a) between perceived usefulness and usage of voice assistants and (b) between perceived playfulness and usage of voice assistants.

Frequently using a new technology enhances the familiarity and comfort level of the consumer, and hence, the frequency with which consumers use new technology has been argued to moderate the usage of new products or services [67]. Marketers differentiate between heavy users and light users in their market segmentation strategy, which indicates that the frequency of use significantly and positively moderates the usage behavior [68]. Similarly, Baptista and Oliveira [69] found that frequency of use positively moderates the use of mobile banking services. In the context of voice assistants, frequent users are likely to become more proficient with various features of their assistants and, hence, may develop a habit of using voice assistants intuitively. Therefore, we advance the following hypotheses:

H7a–b: Frequency of use positively moderates the relationship between usefulness and usage of voice assistants, i.e., 1) information search and 2) task functions.

G. Controls

The prior literature has noted the confounding effects of demographic variables on related consumer behaviors [4], [16]. McLean and Osei-Frimpong [4] suggested that age, gender,

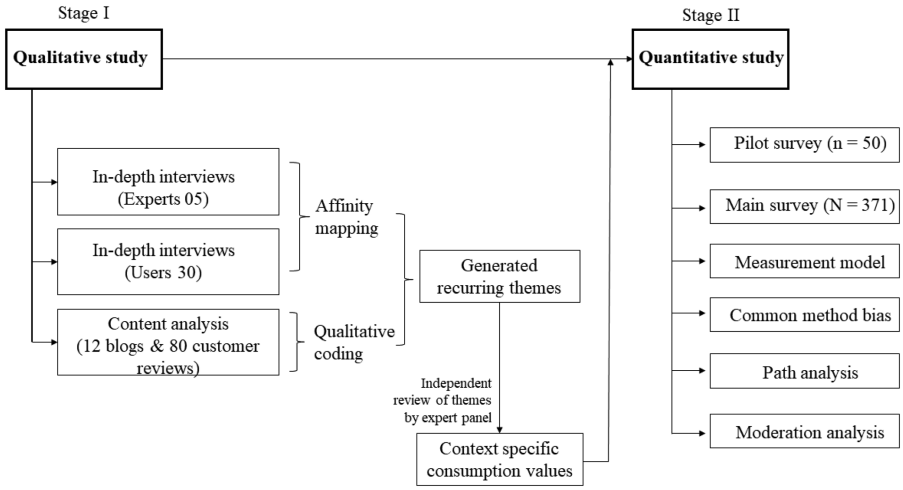

Fig. 2. Overview of the research outline.

educational background, and household size impact the use of in-home voice assistants. Similarly, scholars have argued that younger people are more likely to adopt new technologies [20]. Based on evidence from the extant literature and insights from our qualitative study, we argue that demographic variables—i.e., age and education—may have a confounding effect on the use of voice assistants.

V. Research Method

To identify and measure context-specific consumption values regarding voice assistants, we utilized a mixed-methods research design [16], [70]. The research design consisted of qualitative in-depth interviews [16] both with experts ($n = 5$) and with end-users ($n = 30$) as well as a qualitative content analysis of popular online news articles and consumer reviews related to Alexa and Amazon Echo (Fig. 2). The qualitative study helped us to contextualize the consumption values and formulate the research hypotheses. Next, to validate the hypotheses proposed in the research framework, we conducted quantitative research via an online cross-sectional survey of 371 active consumers of voice assistants.

A. Quantitative Study

A pretest of the above consumption values was conducted using a pilot survey to establish the quality of the survey instruments on parameters such as readability, clarity, and ambiguity. Further, to empirically validate the five consumption values and their impact on the usage of voice assistants, we employed a cross-sectional survey to collect responses from 371 active users of voice assistants. We discuss the quantitative study by first presenting the proposed hypotheses and then presenting our analysis.

B. Sample and Data Collection

A random sample was selected from an online survey panel, and data were collected from 371 respondents. The online panel was used for two reasons. First, it provided us with a sampling frame at a global level, and second, it helped us to select a random sample. Screening questions were posed to select respondents who had been using voice assistants for at least three months. Data cleaning was conducted to remove incomplete responses, unengaged respondents, and outliers. A usable sample of 371 respondents was obtained after cleaning the data (Table III). Further, we preprocessed the data to test the following: 1) normality, 2) multicollinearity, and 3) homoscedasticity. The three conditions for multivariate analysis were satisfied, and hence, we decided to proceed with analyzing the data using structural equation modeling (SEM).

TABLE III
Sample Characteristics

		Total	Percentage
Gender	Male	207	55.79%
	Female	164	44.20%
Age (in years)	*18–24*	87	23.45%
	25–34	94	25.34%
	35–44	76	20.48%
	45–54	64	17.25%
	≤55	50	13.48%
Total		371	100%

The collected data were comparable across geographic locations, genders, and age groups. The respondents reported using one of the following voice assistants: Amazon Alexa, Apple Siri, and OK Google. These voice assistants were chosen for the article because they were able to perform multiple functions. One-third of respondents (36.4%) reported using their voice assistants for multiple purposes, i.e., conducting transactions, searching for information, and completing various tasks. Moreover, the selected voice assistants can be integrated with unique brands; they can order a cab, book a flight, replenish groceries, etc. [4].

TABLE IV
CONFIRMATORY FACTOR ANALYSIS

Study measure*	Measurement items	Factor loadings
Personification (PR) [74]	The voice assistant sounds like a human to me.	0.81
	I find my voice assistant friendly.	0.78
	My voice assistant is quite competent.	0.86
	I feel attached to my voice assistant.	0.78
	I feel delighted while interacting with my voice assistant.	0.77
	My voice assistant is quite intelligent.	0.68
	I find my voice assistant to be often sensitive to my needs.	0.66
Social identity (SI) [4], [30]	The use of voice assistants among people around me is growing fast.	0.76
	I have heard a lot about the features and benefits of using voice assistants.	0.72
	People I know will appreciate the fact that I use a voice assistants.	0.69
	I get a lot of encouragement from people around me for using my voice assistant.	0.71
Convenience (CV) [75]	It is more convenient for me to complete tasks just with a voice command.	0.90
	Voice assistant allows multi-tasking.	0.86
	I can automate some of my routine tasks using my voice assistant.	0.87
	I like the ability of my voice assistant to save my time and effort in doing things.	0.84
	Interacting with the voice assistant is easy and clearly understandable.	0.80
Perceived usefulness (PU) [1], [4]	Using voice assistant in my work enables me to accomplish my tasks more quickly.	0.87
	Using voice assistant improves my work performance.	0.85
	Using voice assistant is useful in my daily life.	0.88
	I find voice assistant more helpful than sales agents.	0.82
	Using voice assistant is a more efficient way of working.	0.78
	Using voice assistant improves my work experience.	0.72
Perceived playfulness (PP) [30]	Voice assistant makes the work more interesting and playful.	0.88
	Using voice assistant is satisfying.	0.88
	The engagement I have with a voice assistant is always meaningful.	0.78
	I am always curious to use my voice assistant and do new things with it.	0.85
	I actively look forward to instances where I can use a voice assistant.	0.76
Information search (IS) [20]	I commonly use voice assistant to search for information.	0.81
	Voice assistant is a helpful learning tool.	0.74
	I regularly ask questions to my voice assistant.	0.75
Task function (TS)	I use voice assistant regularly to play music.	0.92
	I use the voice assistant to place orders online.	0.86
	I use the voice assistant to control my smart devices.	0.71
	Voice assistant is now an important tool for me, and I rely a lot on my voice assistant.	0.75

*All the study measures, including their measurement items, were developed from the qualitative study and the extant literature.

C. Data Analysis

We employed a two-step approach to analyze the data; thus, we first built the confirmatory model and then the structural model [71], [72]. We utilized the confirmatory model to test the reliability and validity of the constructs in the research framework, while we utilized the structural model to examine the strengths and significance of the structural paths proposed in the research framework.

VI. RESULTS

A. Measurement Model

We conducted the confirmatory factor analysis (CFA) using AMOSS 21.0 to establish the validity of the measurement model and to assess the goodness of fit and construct reliability. CFA was employed to examine the psychometric properties of all seven constructs. In addition to the measurement model results, the reliability of each construct, its unidimensionality, and validity were assessed using the average variance extracted (AVE) and composite reliability (CR; Table IV). Further, all item loadings were greater than 0.60; by exceeding the recommended cut-off value of 0.40 suggested by Hair *et al.* [73], these values established the items' reliability. Finally, our assessment confirmed the absence of multicollinearity in our model. Table V summarizes the model fit indices for both the measurement and structural models.

A satisfactory model fit was obtained. Both the standardized factor loadings of the items and the AVE values of the constructs exceeded 0.50, and the CR values exceeded 0.70; hence, the convergent validity was established [76], [77]. All constructs displayed high levels of reliability (0.80 or higher) [76]. Discriminant validity was established because the AVE values of the constructs exceeded the squared interfactor correlations (Table VI).

TABLE V
MODEL FIT INDICES

Goodness of fit measures	Recommended value	Structural model	Measurement model
Chi-square/degree of freedom	≤ 3.00	2.43	1.45
Goodness of fit (GFI)	≥ 0.90	0.97	0.90
Adjusted goodness of fit (AGFI)	≥ 0.80	0.91	0.88
Normalised fit index (NFI)	≥ 0.90	0.96	0.92
Comparative fit index (CFI)	≥ 0.90	0.97	0.97
Root mean square error of approximation (RMSEA)	≤ 0.10	0.04	0.03
Tucker–Lewis fit index (TLI)	≥ 0.90	0.93	0.97

TABLE VI
VALIDITY AND RELIABILITY ESTIMATES

	$\bar{X}$	σ	CR	AVE	MSV	ASV	SI	PU	PP	PR	CV	TF	IS
SI	2.72	0.66	0.81	0.52	0.16	0.11	**0.72**						
PU	3.97	0.57	0.93	0.68	0.30	0.18	0.32	**0.82**					
PP	3.63	0.75	0.92	0.69	0.29	0.18	0.31	0.48	**0.83**				
PR	3.15	0.74	0.91	0.59	0.29	0.16	0.39	0.36	0.54	**0.77**			
CV	2.15	0.71	0.93	0.73	0.16	0.09	0.40	0.23	0.23	0.39	**0.86**		
TF	4.04	0.65	0.89	0.67	0.41	0.16	0.17	0.51	0.36	0.26	0.23	**0.82**	
IS	4.77	0.48	0.81	0.59	0.41	0.22	0.31	0.55	0.51	0.43	0.22	0.64	**0.77**

Bold values on diagonal = SQRT (AVE); off-diagonal = correlation coefficients, composite reliability (CR), average variance extracted (AVE), maximum shared variance (MSV), average shared variance (ASV); SI = social identity, PU = perceived usefulness, PP = perceived playfulness, PR = personification, CV = convenience, TF = task function, IS = information search.

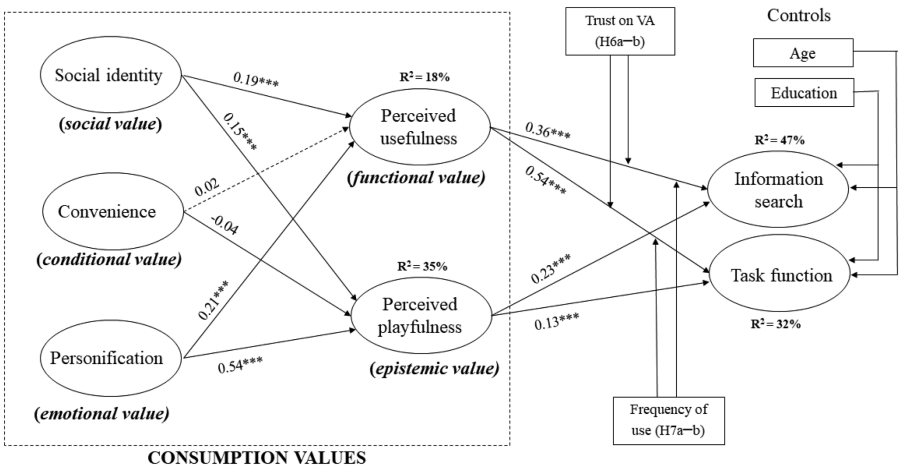

Fig. 3. Structural model.

B. Common Method Bias

Because they include self-reported behavioral constructs, the data collected for the article were vulnerable to common method bias [78]. We attempted to address this issue via a multipronged approach suggested by Chang *et al.* [79]. First, we randomized the questionnaire items and worked to reduce ambiguity in the instrument [80]. Second, we informed respondents that the purpose of the article was academic and assured them that their identities would remain anonymous. We also informed respondents that there were no right or wrong answers and that we were interested solely in understanding their perceptions regarding the various aspects of using voice assistants [78]. Upon completing the data collection, we conducted a *post hoc* Harman's single factor test; this test showed that the total variance explained by the single factor was 30.29%, which was well below the cut-off value of 50% [81]. Finally, we included a common latent factor and observed no common method bias. Therefore, we assumed that common method variance was absent and that further correction for it was not required while testing the structural model.

C. Structural Model

The research model (Fig. 3) was empirically validated using the SEM with the maximum likelihood method. The results indicated a good model fit with acceptable indicators. The chi-square was significant ($\chi^2 = 133.79$, $df = 55$, $p = 0.00$, $\chi^2/df = 2.43$). The other model fit indices, such as the root mean square error of approximation (RMSEA = 0.04), the comparative fit index (CFI = 0.97), and the Tucker–Lewis fit index (TLI = 0.93), fell within the recommended cut-off values [73], [82], [83].

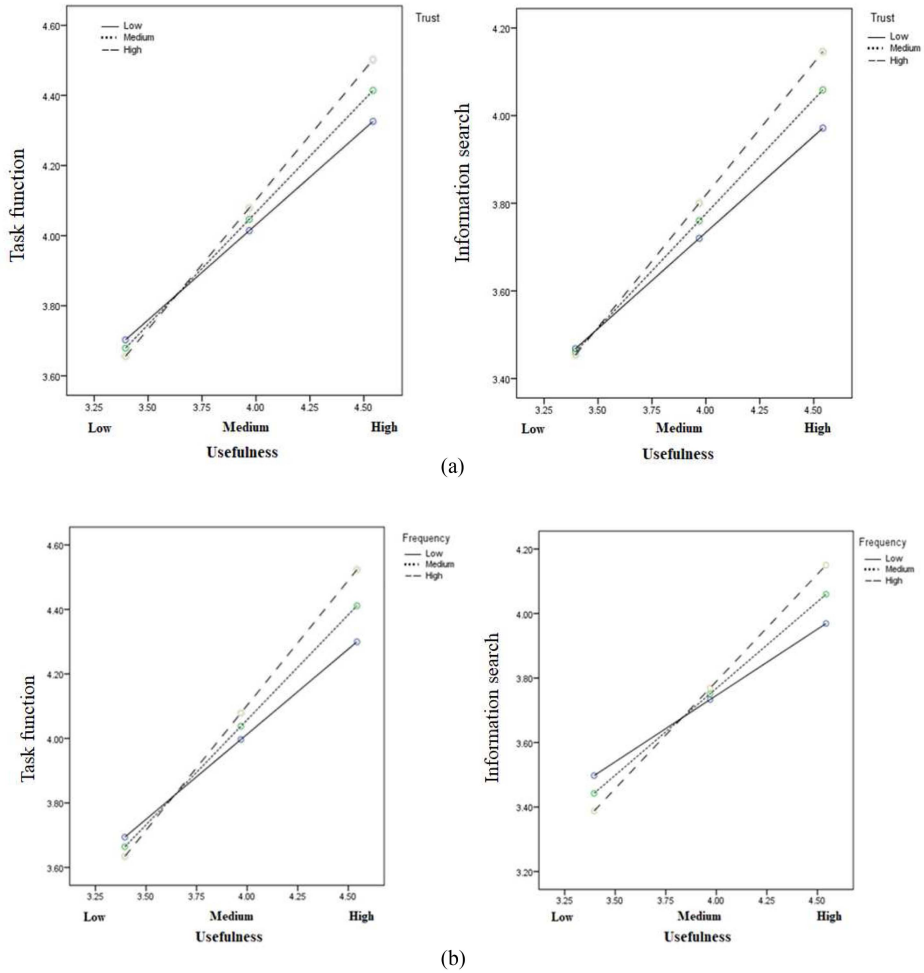

Fig. 4. (a) Moderating effects—Trust x usefulness. (b) Moderating effects—Frequency of use x usefulness.

The analysis supported all hypotheses except H4a and H4b (Fig. 3). While social identity was positively associated with perceived usefulness ($\beta = 0.21$, $p < 0.001^{***}$) and perceived playfulness ($\beta = 0.12$, $p < 0.01^{**}$), it had a direct association with information search ($\beta = 0.\ 02$, $p < 0.001^{***}$). Personification positively affected both perceived usefulness ($\beta = 0.27$, $p < 0.001^{***}$) and perceived playfulness ($\beta = 0.\ 27$, $p < 0.001^{***}$). Perceived usefulness was positively associated with both information search ($\beta = 0.39$, $p < 0.001^{***}$) and task function ($\beta = 0.46$, $p < 0.001^{***}$). Similarly, perceived playfulness was positively associated with both information search ($\beta = 0.26$, $p < 0.001^{***}$) and task function ($\beta = 0.13$, $p < 0.001^{***}$).

D. Moderators and Control Variables

We employed the Hayes PROCESS macro method to examine the moderating effects of frequency of use and trust on the outcome variables [84]. We utilized 5000 bootstrap samples at a confidence interval of 95% to assess the moderating effect. Fig. 4 visualizes these moderation effects. Frequency of use significantly moderated the associations between perceived usefulness and information search ($\beta = 0.08$, $p < 0.05$, CI [0.038–0.113]) and between perceived usefulness and task function ($\beta = 0.07$, $p < 0.05$, CI [0.019–0.128]). However, frequency of use had no moderating effect on the association between perceived playfulness and usage of voice assistants. Trust moderated the association between perceived usefulness and usage of voice assistants, i.e., task function ($\beta = 0.10$, $p < 0.001$, CI [0.002–0.193]) and information search ($\beta = 0.08$, $p < 0.001$, CI [0.019–0.148]).

Finally, we controlled for age and education. While the results indicated insignificant confounding effects for age, education significantly influenced the outcome variables. These findings are consistent with the prior literature [4].

VII. Discussion

This article made a systematic attempt to understand the ways in which consumption values drive consumers to use voice assistants for various purposes as well as the ways in which these consumption values are interrelated. We adopted a mixed-methods approach to answer the above questions. First, we employed a qualitative study to identify the consumption values relevant to the context of voice assistants: social identity, personification, convenience, perceived usefulness, and perceived playfulness. The qualitative study further facilitated our efforts to identify the measurement items for the above constructs. Thereafter,

an extensive review of the literature enabled us to construct the hypotheses, and we empirically investigated the proposed relationships by measuring the constructs via an online survey panel. The research findings empirically supported all hypotheses except H4a and H4b.

We found that perceived usefulness and perceived playfulness shared a significant positive association with information search and task function (H1 and H2). Consumers appreciate the ability of voice assistants to generate pleasurable experiences because these experiences satisfy consumers' hedonic motives. Therefore, the greater the perceived playfulness, the more likely consumers are to use their voice assistants. Similarly, consumers perceive their voice assistants as useful and are, therefore, likely to use them for both information search and task functions.

The results supporting H3 suggest that social identity, an important consumption value, is positively associated with usefulness and playfulness. The article results also suggest that consumers are motivated to use voice assistants because these assistants provide them with opportunities to express their social identity in a digitally dominated social environment. Furthermore, as their need for self-expression is satisfied, consumers develop an emotional connection with their voice assistants. For these reasons, consumers consider the use of voice assistants to be both useful and enjoyable. This finding aligns with the observations of Ogbanufe and Gerhart [46] in the context of smartwatches.

H4 was not supported because the results suggest that conditional value, i.e., convenience, is associated with neither perceived usefulness (H4a) nor perceived playfulness (H4b). These findings are consistent with the arguments of Park and Lee [39] who found conditional value to be inappropriate in the context of online games. Turel *et al.* [30] likewise removed conditional value from their research framework while examining consumers' behavioral intentions to use digital artifacts. Convenience is an inherent characteristic of voice assistants, and hence, consumers can use their voice assistants at any time. Other possible reason for our findings could be that although voice assistants are becoming increasingly popular, consumers' awareness of their potential functions and specifications remains extremely low. The respondents in the current article may thus have failed to fully envision the conditions under which voice assistants can create additional convenience, and as a result, convenience was not a significant value for the users in this article.

The results supporting H5 suggest that personification, another important consumption value, is positively associated with both perceived usefulness (H5a) and perceived playfulness (H5b). Humanizing voice assistants (e.g., Alexa and Siri) in conversation—for example, by having them greet their users with "Good morning!" or "Have a good day!"—reinforces their personification; in response to these greetings, consumers reciprocate by saying "thank you," which, in turn, causes consumers to perceive their assistants as playful. This implies that personification enhances interactions between consumers and their voice assistants and increases playfulness [60]. Furthermore, by interacting with intelligent voice assistants, consumers enjoy the control they exercise over their voice assistants as a master or a companion [9]. Therefore, consumers find voice assistants to be useful.

The support for H3 and H5 demonstrates that the consumption values are interrelated and share positive associations; however, the extant literature rarely studies these interrelations.

The article's results confirm the significant positive moderating impacts of trust (H6) and frequency of use (H7) on the associations between perceived usefulness and information search and between perceived usefulness and task function. To the best of the authors' knowledge, none of the existing studies have examined trust and frequency of use as moderators in the context of voice assistants or digital artifacts. Consequently, we are unable to draw connections between our findings regarding these moderating variables and the extant literature. The findings from our article's qualitative interviews reveal that consumers trust their voice assistants when shopping for groceries and ordering pizza. When consumers place high trust in their voice assistants, however, they are more likely to use them for information search and task function, which, in turn, increase the likelihood that consumers will consider their assistants useful. Furthermore, the findings from our qualitative interviews also indicate that consumers who perceive a high risk (i.e., low trust) in using voice assistants are less likely to engage in information search as well as task function.

A. *Theoretical Implications*

This article makes four major contributions to the existing literature. First, voice assistants are becoming increasingly popular, and their penetration is expected to grow exponentially. However, little is known about the underlying behavioral dimensions that drive their use. This article aims to bridge the gaps in the extant literature and thereby advance our understanding of consumer behavior in the context of this new and highly interactive technology.

Second, ours is the first article to adopt the TCV framework and empirically extend its generic values to the context of voice assistants to better understand the consumption values that drive these assistants' use. Therefore, the research framework presented in this article and its subsequent empirical validation uniquely enhances our understanding of consumer behavior in the context of voice technology. The extension of generic values [16], [17] and identification of measurement items for extended constructs using a mixed-methods approach are among the noteworthy contributions of this article. Furthermore, the article contributes to the TCV framework [15] not only by contextualizing and extending that framework for voice assistants but also by lending empirical support to the notion that the five consumption values are not at the same level but are, instead, interrelated.

Third, this article identifies and validates the moderating influences of trust and frequency of use. Previous research has drawn attention to the trust issues associated with digital technology and consumers' intentions to use such technology [5]. While the existing literature remains unequivocal [85] about the role of trust, this article observes that high levels of trust strengthen the association between consumption values and information

search. Further, ours is the first article to add trust as a moderating factor to the TCV framework.

Finally, this article enhances the limited understanding of voice assistant users' consumption values. The article's broad sample encompasses users from the USA, Europe, and India; hence, the results are generalizable to a larger context.

B. Managerial Implications

The findings of this article offer several managerial implications for technology providers and marketers. This article benefits the developers of voice assistants by allowing them to focus on integrating the consumption values that consumers derive from their use of voice assistants. With continuous developments in deep learning, neural network algorithms, natural language processing, and AI, the producers of voice assistants can enhance the human-like qualities of voice assistants, i.e., focus on their personification value, which has the potential to further increase consumers' usage of voice assistants. Similarly, social identity appears to influence perceived usefulness, perceived playfulness, and information search. Therefore, technology providers and marketers can engage with and utilize various influencers and opinion leaders, such as celebrities, to endorse their voice assistants.

The article further finds that consumers use voice assistants for two major purposes: information search and task function. Therefore, not only the producers of voice assistants but also other marketers can work to optimize their online content to be searchable by voice assistants. Additionally, marketers must reconsider their SEO algorithms and create content strategies to boost SEO in the context of the search queries consumers commonly raise on voice assistants. Brands can capitalize on the insights from this article to create effective voice search strategies and thereby offer unique and personalized consumer experiences.

The article's findings also reveal that consumers who use their voice assistants to perform tasks such as controlling IoT devices and placing online orders are influenced by their devices' perceived usefulness and perceived playfulness. Therefore, developers working to design applications for voice assistants should focus on imbuing voice assistants with skills that meet consumers' task completion needs. For example, based on the five consumption values discussed in this article, a home appliance firm might integrate intelligent voice skills into their devices.

Finally, this article demonstrates that trust is an important concern for users and consumers who might perceive voice assistants as intrusive. The empirical evidence confirms trust's significant negative influence on information search. Therefore, the producers of voice assistants must reassure consumers about the nonintrusiveness of voice assistants and develop effective communication campaigns to convince consumers that their search queries will remain confidential.

C. Conclusion, Limitations, and Future Research

Consumption values can facilitate the adoption and continuous usage of voice assistants. The extant literature has argued that consumption values derive from the usage of digital artifacts. However, this assertation lacked evidence in the context of voice assistants. This article represents an initial attempt to bridge this gap by proposing a consumption-value-based theoretical model and validating it with data from active users of voice assistants across three continents. Attempting to extend the TCV literature and further our understanding of consumer behavior in the context of voice assistants [86], [87], this article examined 1) the associations between the consumption values, 2) the associations of perceived usefulness and perceived playfulness with consumers' use of voice assistants, i.e., information search and task function, and 3) the moderating effect of trust and frequency of use on the associations between perceived usefulness and consumers' use of voice assistants.

Despite its contributions, the present article has some limitations that can be addressed in future research. First, we limit our analysis in this article to the perspective of consumption values. However, future studies can employ a different approach, such as stimulus-organism-response [88], [89] or behavioral reasoning theory [90], [91], to provide alternative explanations of consumer behavior in the context of voice assistants. Second, we classify this behavior into two categories of usage. Future research studies can further classify the usage of voice assistants on different parameters, such as transactional vs nontransactional usage, and it would be interesting to explore the ways in which consumption values influence user behavior under these new classifications. Third, the current article includes only two types of moderating variables. In future studies, scholars can include additional moderating variables to capture changes in consumer behavior under the influence of new moderators. For example, it would be interesting to compare and contrast users and nonusers of voice assistants. Fourth, because it relies on cross-sectional data and a self-reported research design, the current article suffers from methodological limitations, and it cannot establish causality between the variables. Therefore, scholars should utilize longitudinal designs to understand behavioral modifications over particular periods of ownership. Finally, experiments can be conducted to determine the causality between the key variables.

REFERENCES

[1] E. Moriuchi, "Okay, Google! An empirical study on voice assistants on consumer engagement and loyalty," *Psychol. Marketing*, vol. 36, no. 5, pp. 489–501, 2019.
[2] S. Karnouskos, "Self-driving car acceptance and the role of ethics," *IEEE Trans. Eng. Manage.*, vol. 67, no. 2, pp. 252–265, May 2020.
[3] H. Feng, K. Fawaz, and K. G. Shin, "Continuous authentication for voice assistants," in *Proc. 23rd Annu. Int. Conf. Mobile Comput. Netw.*, Oct. 2017, pp. 343–355.
[4] G. McLean and K. Osei-Frimpong, "Hey Alexa …examine the variables influencing the use of artificial intelligent in-home voice assistants," *Comput. Human Behav.*, vol. 99, pp. 28–37, 2019.
[5] M. B. Hoy, "Alexa, Siri, Cortana, and more: An introduction to voice assistants," *Med. Ref. Service Quart.*, vol. 37, no. 1, pp. 81–88, 2018.
[6] K. T. Smith, "Marketing via smart speakers: What should Alexa say?," *J. Strategic Marketing*, vol. 28, no. 4, pp. 350–365, 2020.
[7] L. Burbach, P. Halbach, N. Plettenberg, J. Nakayama, M. Ziefle, and A. C Valdez, "'Hey, Siri', 'Ok, Google', 'Alexa'. Acceptance-relevant factors of virtual voice-assistants," in *Proc. IEEE Int. Professional Commun. Conf.*, Jul. 2019, pp. 101–111.

[8] I. Stenvanovic, "41 voice search statistics you need to hear in 2020," Kommando tech., 2020. Accessed: Aug. 2, 2020. [Online]. Available: https://kommandotech.com/statistics/voice-search-statistics/
[9] F. Schweitzer, R. Belk, W. Jordan, and M. Ortner, "Servant, friend or master? The relationships users build with voice-controlled smart devices," *J. Marketing Manage.*, vol. 35, no. 7–8, pp. 693–7155, 2019.
[10] M. McCaffrey, P. Hayes, J. Wagner, and M. Hobbs, "Consumer intelligence series: Prepare for the voice revolution," PwC, USA, 2018. Accessed: Jul. 13, 2019. [Online]. Available: https://www.pwc.com/us/en/advisory-services/publications/consumer-intelligence-series/voice assistants.pdf
[11] X. Lei, G. H. Tu, A. X. Liu, C. Y. Li, and T. Xie, "The insecurity of home digital voice assistants-vulnerabilities, attacks and countermeasures," in *Proc. IEEE Conf. Commun. Netw. Secur.*, May 2018, pp. 1–9.
[12] B. Kinsella, "Google again leads in voice assistant IQ test but alexa is closing the gap according to loup ventures," voicebot.ai. 2019. Accessed: Aug. 9, 2020. [Online]. Available: https://voicebot.ai/voice assistant-seo-report-for-brands/
[13] P. Klaus and J. Zaichkowsky, "AI voice bots: Services marketing research agenda," *J. Service Marketing*, vol. 34, no. 3, pp. 389–398, 2020.
[14] A. Kaplan and M. Haenlein, "Siri, Siri, in my hand: Who's the fairest in the land? On the interpretations, illustrations, and implications of artificial intelligence," *Bus. Horiz.*, vol. 62, no. 1, pp. 15–25, 2019.
[15] J. N. Sheth, B. I. Newman, and B. L. Gross, "Why we buy what we buy: A theory of consumption values," *J. Bus. Res.*, vol. 22, no. 2, pp. 159–170, 1991.
[16] S. Talwar, A. Dhir, P. Kaur, and M. Mäntymäki, "Why do people purchase from online travel agencies (OTAs)? A consumption values perspective," *Int. J. Hospitality Manage.*, vol. 88, 2020, Art. no. 102534.
[17] M. Mäntymäki, A. N. Islam, and I. Benbasat, "What drives subscribing to premium in freemium services? A consumer value-based view of differences between upgrading to and staying with premium," *Inf. Syst. J.*, vol. 30, no. 2, pp. 295–333, 2020.
[18] T. Sedano, P. Ralph, and C. Peraire, "Dual-track development," *IEEE Softw.*, vol. 37, no. 6, pp. 58–64, 2020.
[19] J. Martin, G. Mortimer, and L. Andrews, "Re-examining online customer experience to include purchase frequency and perceived risk," *J. Retailing Consum. Serv.*, vol. 25, pp. 81–95, 2015.
[20] V. Venkatesh, J. Y. Thong, and X. Xu, "Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology," *MIS Quart.*, vol. 36, pp. 157–178, 2012.
[21] H. Yang and H. Lee, "Exploring user acceptance of streaming media devices: An extended perspective of flow theory," *Inf. Syst. e-Bus. Manage.*, vol. 16, no. 1, pp. 1–27, 2018.
[22] A. Boonrod and P. Ketavan, "The future is voice," *Res. World*, vol. 71, pp. 40–45, 2018.
[23] B. Boyle, "What is Siri? Apple's personal voice assistant explained," Pocket-lint, 2017. Accessed: Nov. 25, 2019. [Online]. Available: http://www.pocket-lint.com/news/112346-what-is-siriapple-s-personal-voice assistant-explained
[24] T. Laukkanen, "Consumer adoption versus rejection decisions in seemingly similar service innovations: The case of the Internet and mobile banking," *J. Bus. Res.*, vol. 69, no. 7, pp. 2432–2439, 2016.
[25] R. P. Bagozzi, "The legacy of the technology acceptance model and a proposal for a paradigm shift," *J. Assoc. Inf. Syst.*, vol. 8, no. 4, 2007, Art. no. 3.
[26] E. M. Van Raaij and J. J. Schepers, "The acceptance and use of a virtual learning environment in China," *Comput. Educ.*, vol. 50, no. 3, pp. 838–852, 2008.
[27] A. L. Guzman, "Voices in and of the machine: Source orientation toward mobile virtual assistants," *Comput. Human Behav.*, vol. 90, pp. 343–350, 2019.
[28] J. Zhang and E. Mao, "What's around me? 'Applying the theory of consumption values to understanding the use of location-based services (LBS) on smart phones," *Int. J. E-Bus. Res.*, vol. 8, no. 3, pp. 33–49, 2012.
[29] T. Y. Chen, Y. C. Liu, and Y. M. Chen, "Research on product common attribute model with consumption value theory applied in food industry," in *Proc. IEEE Int. Conf. Ind. Eng. Eng. Manage.*, Dec. 2013, pp. 447–451.
[30] O. Turel, A. Serenko, and N. Bontis, "User acceptance of hedonic digital artifacts: A theory of consumption values perspective," *Inf. Manage.*, vol. 47, no. 1, pp. 53–59, 2010.
[31] N. Hajli, Y. Wang, M. Tajvidi, and M. S. Hajli, "People, technologies, and organizations interactions in a social commerce era," *IEEE Trans. Eng. Manage.*, vol. 64, no. 4, pp. 594–604, Nov. 2017.
[32] K. Petrovčiková and F. Sudzina, "Smartphone adoption: Design of factors within the framework of theory of consumption values," in *Consumer Behavior, Organizational Strategy and Financial Economics*, M. H. Bilgin, H. Danis, E. Demir, and U. Can, Eds. Cham, Switzerland: Springer, 2018, pp. 53–62.
[33] S. Y. Youn and K. H. Lee, "Proposing value-based technology acceptance model: Testing on paid mobile media service," *Fashion Textiles*, vol. 6, no. 1, 2019, Art. no. 13.
[34] K. Park, C. Kwak, J. Lee, and J. H. Ahn, "The effect of platform characteristics on the adoption of smart speakers: Empirical evidence in South Korea," *Telematics Inform.*, vol. 35, no. 8, pp. 2118–2132, 2018.
[35] D. Pal, C. Arpnikanondt, S. Funilkul, and V. Varadarajan, "User experience with smart voice assistants: The accent perspective," in *Proc. IEEE 10th Int. Conf. Comput., Commun. Netw. Technol.*, Jul. 2019, pp. 1–6.
[36] P. Kowalczuk, "Consumer acceptance of smart speakers: A mixed-methods approach," *J. Res. Interact. Marketing*, vol. 12, no. 4, pp. 418–431, 2018.
[37] H. Yang and H. Lee, "Understanding user behavior of virtual personal assistant devices," *Inf. Syst. e-Bus. Manage.*, vol. 17, no. 1, pp. 65–87, 2019.
[38] M. Mäntymäki and J. Salo, "Why do teens spend real money in virtual worlds? A consumption values and developmental psychology perspective on virtual consumption," *Int. J. Inf. Manage.*, vol. 35, no. 1, pp. 124–134, 2015.
[39] B. W. Park and K. C. Lee, "Exploring the value of purchasing online game items," *Comput. Human Behav.*, vol. 27, no. 6, pp. 2178–2185, 2011.
[40] T. Ahn, S. Ryu, and I. Han, "The impact of web quality and playfulness on user acceptance of online retailing," *Inf. Manage.*, vol. 44, no. 3, pp. 263–275, 2007.
[41] S. Yang, B. Wang, and Y. Lu, "Exploring the dual outcomes of mobile social networking service enjoyment: The roles of social self-efficacy and habit," *Comput. Human Behav.*, vol. 64, pp. 486–496, 2016.
[42] D. Sledgianowski and S. Kulviwat, "Using social network sites: The effects of playfulness, critical mass and trust in a hedonic context," *J. Comput. Inf. Syst.*, vol. 49, pp. 74–83, 2009.
[43] H. He, Y. Li, and L. Harris, "Social identity perspective on brand loyalty," *J. Bus. Res.*, vol. 65, no. 5, pp. 648–657, 2012.
[44] M. McGowan, E. Shiu, and L. M. Hassan, "The influence of social identity on value perceptions and intention," *J. Consum. Behav.*, vol. 16, no. 3, pp. 242–253, 2017.
[45] M. Bødker, G. Gimpel, and J. Hedman, "The user experience of smart phones: A consumption values approach," in *Proc. 8th Global Mobility Roundtable: Transformation Mobility*, 2009, pp. 1–12.
[46] O. Ogbanufe and N. Gerhart, "The mediating influence of smartwatch identity on deep use and innovative individual performance," *Inf. Syst. J.*, vol. 30, no. 6, pp. 977–1009, 2020.
[47] K. L. Hsiao and C. C. Chen, "What drives smartwatch purchase intention? Perspectives from hardware, software, design, and value," *Telematics Inform.*, vol. 35, no. 1, pp. 103–113, 2018.
[48] Y. Liu and M. Han, "Determining the key factors of wearable devices consumers' adoption behavior based on an MADM model for product improvement," *IEEE Trans. Eng. Manage.*, to be published, doi: 10.1109/TEM.2019.2960499.
[49] J. Liu, J. M. Thomas, and S. Higgs, "The relationship between social identity, descriptive social norms and eating intentions and behaviors," *J. Exp. Social Psychol.*, vol. 82, pp. 217–230, 2019.
[50] J. J. Sierra and S. McQuitty, "Attitudes and emotions as determinants of nostalgia purchases: An application of social identity theory," *J. Marketing Theory Pract.*, vol. 15, no. 2, pp. 99–112, 2007.
[51] S. H. Hsieh and T. H. Tseng, "Playfulness in mobile instant messaging: Examining the influence of emoticons and text messaging on social interaction," *Comput. Human Behav.*, vol. 69, pp. 405–414, 2017.
[52] R. A. Dunn and R. E. Guadagno, "My avatar and me—Gender and personality predictors of avatar-self discrepancy," *Comput. Human Behav.*, vol. 28, no. 1, pp. 97–106, 2012.
[53] W. M. Hur, J. J. Yoo, and T. L. Chung, "The consumption values and consumer innovativeness on convergence products," *Ind. Manage. Data Syst.*, vol. 112, pp. 688–706, 2012.
[54] C. C. Chang, C. Liang, C. F. Yan, and J. S. Tseng, "The impact of college students' intrinsic and extrinsic motivation on continuance intention to use English mobile learning systems," *Asia-Pacific Educ. Res.*, vol. 22, no. 2, pp. 181–192, 2013.
[55] D. L. Strayer, J. M. Cooper, J. Turrill, J. R. Coleman, and R. J. Hopman, "The smartphone and the driver's cognitive workload: A comparison of Apple, Google, and Microsoft's intelligent personal assistants," *Can. J. Exp. Psychol./Revue Canadienne de Psychologie Expérimentale*, vol. 71, no. 2, pp. 93–110, 2017.

[56] J. Chung and F. B. Tan, "Antecedents of perceived playfulness: An exploratory study on user acceptance of general information-searching websites," *Inf. Manage.*, vol. 41, no. 7, pp. 869–881, 2004.
[57] C. E. Yu, "Humanlike robots as employees in the hotel industry: Thematic content analysis of online reviews," *J. Hospitality Marketing Manage.*, vol. 29, no. 1, pp. 22–38, 2020.
[58] A. Purington, J. G. Taft, S. Sannon, N. N. Bazarova, and S. H. Taylor, "'Alexa is my new BFF' social roles, user satisfaction, and personification of the Amazon Echo," in *Proc. CHI Conf. Extended Abstr. Human Factors Comput. Syst.*, May 2017, pp. 2853–2859.
[59] Y. Yuan *et al.*, "Speech interface reformulations and voice assistant personification preferences of children and parents," *Int. J. Child-Comput. Interact.*, vol. 21, pp. 77–88, 2019.
[60] A. Pradhan, L. Findlater, and A. Lazar, "'Phantom friend' or 'Just a box with information'? Personification and ontological categorization of smart speaker-based voice assistants by older adults," in *Proc. ACM Human-Comput. Interact.*, 2019, pp. 1–21.
[61] J. Park and S. Yang, "The moderating role of consumer trust and experiences: Value driven usage of mobile technology," *Int. J. Mobile Marketing*, vol. 1, no. 2, pp. 24–32, 2006.
[62] N. Chung, H. G. Song, and H. Lee, "Consumers' impulsive buying behavior of restaurant products in social commerce," *Int. J. Contemporary Hospitality Manage.*, vol. 29, no. 2, pp. 709–731, 2017.
[63] A. Wells, A. B. Usman, and J. McKeown, "Trusting smart speakers: Understanding the different levels of trust between technologies," *Int. J. Comput. Sci. Secur.*, vol. 14, no. 2, pp. 72–81, 2020.
[64] N. K. Lankton, D. H. McKnight, and J. F. Tripp, "Understanding the antecedents and outcomes of Facebook privacy behaviors: An integrated model," *IEEE Trans. Eng. Manage.*, vol. 67, no. 3, pp. 697–711, 2019.
[65] J. M. Hansen, G. Saridakis, and V. Benson, "Risk, trust, and the interaction of perceived ease of use and behavioral control in predicting consumers' use of social media for transactions," *Comput. Human Behav.*, vol. 80, pp. 197–206, 2018.
[66] J. Föhr and C. C. Germelmann, "Alexa, who are you? Consumer trust in and mental representations of smart home technologies," in *Proc. Int. Conf. Challenges Manage. Smart Products Serv.*, Aug. 22/23, 2019, pp. 1–6. Accessed: Aug. 09, 2020. [Online]. Available: https://eref.uni-bayreuth.de/id/eprint/53372
[67] T. Natarajan, S. A. Balasubramanian, and D. L. Kasilingam, "Understanding the intention to use mobile shopping applications and its influence on price sensitivity," *J. Retailing Consum. Serv.*, vol. 37, pp. 8–22, 2017.
[68] C. Chen, "Perceived risk, usage frequency of mobile banking services," *Manage. Service Qual.: Int. J.*, vol. 23, no. 5, pp. 410–436, 2013.
[69] G. Baptista and T. Oliveira, "Understanding mobile banking: The unified theory of acceptance and use of technology combined with cultural moderators," *Comput. Human Behav.*, vol. 50, pp. 418–430, 2015.
[70] A. Dhir, G. M. Chen, and S. Chen, "Why do we tag photographs on Facebook? Proposing a new gratifications scale," *New Media Soc.*, vol. 19, no. 4, pp. 502–521, 2017.
[71] J. Cohen, "Weighted kappa: Nominal scale agreement provision for scaled disagreement or partial credit," *Psychol. Bull.*, vol. 70, no. 4, pp. 213–220, 1968.
[72] J. C. Anderson and D. W. Gerbing, "Structural equation modeling in practice: A review and recommended two-step approach," *Psychol. Bull.*, vol. 103, no. 3, pp. 411–423, 1988.
[73] J. F. Hair, C. M. Ringle, and M. Sarstedt, "PLS-SEM: Indeed a silver bullet," *J. Marketing Theory Pract.*, vol. 19, no. 2, pp. 139–152, 2011.
[74] W. Wang, "Smartphones as social actors? Social dispositional factors in assessing anthropomorphism," *Comput. Human Behav.*, vol. 68, pp. 334–344, 2017.
[75] X. Xiao, J. Hedman, and E. Runnemark, "Use of payment technology: A perspective based on theory of consumption value," in *Proc. Res.–Prog. Papers*, 2015, Art. no. 40.
[76] C. Fornell and D. F. Larcker, "Structural equation models with unobservable variables and measurement error: Algebra and statistics," *J. Marketing Res.*, vol. 18, no. 3, pp. 382–388, 1981.
[77] J. F. Hair, R. E. Anderson, R. L. Tatham, and W. C. Black, *Multivariate Data Analysis*. Upper Saddle River, NJ, USA: Prentice Hall, 1998.
[78] P. M. Podsakoff, S. B. MacKenzie, J. Y. Lee, and N. P. Podsakoff, "Common method biases in behavioral research: A critical review of the literature and recommended remedies," *J. Appl. Psychol.*, vol. 88, no. 5, pp. 879–903, 2003.
[79] F. Chang, W. Qiu, R. H. Zamar, R. Lazarus, and X. Wang, "Clues: An R package for nonparametric clustering based on local shrinking," *J. Statist. Softw.*, vol. 33, no. 4, pp. 1–16, 2010.
[80] A. K. Kaushik and Z. Rahman, "An alternative model of self-service retail technology adoption," *J. Service Marketing*, vol. 29, no. 5, pp. 406–420, 2015.
[81] D. Harman, "A single factor test of common method variance," *J. Psychol.*, vol. 35, pp. 359–378, 1967.
[82] M. W. Browne and R. Cudeck, "Alternative ways of assessing model fit," in *Testing Structural Equation Models*, K. A. Bollen and J. S. Long, Eds. USA: Sage, 1993, pp. 136–162.
[83] L. T. Hu and P. M. Bentler, "Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives," *Struct. Equ. Model.: Multidisciplinary J.*, vol. 6, no. 1, pp. 1–55, 1999.
[84] A. F. Hayes, "PROCESS: A versatile computational tool for observed variable mediation, moderation, and conditional process modeling," White Paper, 2012.
[85] P. A. Rauschnabel, J. He, and Y. K. Ro, "Antecedents to the adoption of augmented reality smart glasses: A closer look at privacy risks," *J. Bus. Res.*, vol. 92, pp. 374–384, 2018.
[86] P. Kaur, A. Dhir, R. Rajala, and Y. Dwivedi, "Why people use online social media brand communities: A consumption value theory perspective," *Online Inf. Rev.*, vol. 42, no. 2, pp. 205–221, 2018.
[87] P. Kaur, A. Dhir, S. Talwar, and K. Ghuman, "The value proposition of food delivery apps from the perspective of theory of consumption value," *Int. J. Contemporary Hospitality Manage.*, vol. 33, no. 4, pp. 1129–1159, 2021.
[88] A. K. Sahu, R. K. Padhy, and A. Dhir, "Envisioning the future of behavioral decision-making: A systematic literature review of behavioral reasoning theory," *Australas. Marketing J.*, vol. 28, no. 4, pp. 145–159, 2020.
[89] A. Dhir, N. Koshta, R. K. Goyal, M. Sakashita, and M. Almotairi, "Behavioral reasoning theory (BRT) perspectives on E-waste recycling and management," *J. Cleaner Prod.*, vol. 280, 2021, Art. no. 124269.
[90] S. Laato, A. N. Islam, A. Farooq, and A. Dhir, "Unusual purchasing behavior during the early stages of the COVID-19 pandemic: The stimulus-organism-response approach," *J. Retailing Consum. Serv.*, vol. 57, 2020, Art. no. 102224.
[91] S. Kumar, M. Murphy, S. Talwar, P. Kaur, and A. Dhir, "What drives brand love and purchase intentions toward the local food distribution system? A study of social media-based REKO (fair consumption) groups," *J. Retailing Consum. Serv.*, vol. 60, 2021, Art. no. 102444.