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The role of the humanisation of smart home speakers in the personalisation–privacy paradox

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ABSTRACT

This article examines the personalisation–privacy paradox through the privacy calculus lens in the context of smart home speakers. It also considers the direct and moderating role of humanisation in the personalisation–privacy paradox. This characteristic refers to how human the device is perceived to be, given its voice's tone and pacing, original responses, sense of humour, and recommendations. The model was tested on a sample of 360 users of different brands of smart home speakers. These users were heterogeneous in terms of age, gender, income, and frequency of use of the device. The results confirm the personalisation–privacy paradox and verify uncanny valley theory, finding the U-shaped effect that humanisation has on risks of information disclosure. They also show that humanisation increases benefits, which supports the realism maximisation theory. Specifically, they reveal that users will perceive the messages received as more useful and credible if the devices seem human. However, the human-likeness of these devices should not exceed certain levels as it increases perceived risk. These results should be used to highlight the importance of the human-like communication of smart home speakers.

1. Introduction

The use of artificial intelligence (AI) in different devices and the use of voice for controlling devices have created a new field of research for academics and practitioners (Guzman, 2018). Voice-based devices such as Amazon Alexa, Google Home, and Siri are considered a new interaction paradigm between human consumers and the Internet of Things (IoT), as well as new operating systems in commerce (Feldman et al., 2010).

A report by Gartner (2018) predicted that 30% of browsing sessions will be made by voice in 2020, and that 20% of citizens will use AI assistants for operational tasks. Smart home speakers, such as Alexa, Siri, and Google Home consist of speakers, cameras, microphones, and interfaces that allow consumers to complete different tasks using interactive voice control (Kowalczuk, 2018).

Smart home speakers are a new type of communication channel and a new touchpoint between brands and consumers. Firms can take advantage of this trend and use voice assistants to offer valuable and personalised messages. Furthermore, voice shopping has begun to attract the attention of practitioners and scholars (Klaus and Zaichkowsky, 2021), as the assistants help consumers with their purchase decision based on customer's preferences (Luo et al., 2019). For this purpose, smart home assistants collect environmental information, information on user preferences, and sometimes private information (Kim and Han, 2014; Xu et al., 2011; Luo et al., 2019). However, consumers often perceive such messages as an intrusion into their privacy, which creates a challenge for companies (Gironda and Korgaonkar, 2018; Krafft et al., 2017). This trade-off between personalisation and privacy has been examined through the personalisation–privacy paradox in various contexts, such as new technologies' usage, travel services, and hotels (Aguirre et al., 2016; Anic et al., 2019; Dinev and Hart, 2006; Lee and Cranage 2011; Xu et al., 2011; Zhu et al., 2017). However, little is known about the relationship between personalisation and privacy in this study context.

Smart home speakers differ from devices considered by previous research in several ways. First, previous research has examined the personalisation–privacy paradox using economic benefits (Lee and Cranage, 2011; Xu et al., 2011; Zhu et al., 2017) such as accessing coupons or promotions; however, in this context, the benefits are related to receiving personalised information. This means that customers not only receive commercial information, but also other types, such as suggestions of music they may like and insights intended to make the

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buying process more efficient. Benefits are not only economic but can also be utilitarian, emotional, or social – of which emotional and social benefits are key (McLean and Osei Frimpong, 2019). Second, previous research has examined the willingness to disclose information. In the current study, we questioned the consumers after they had been using the device for a period of time and had disclosed some personal information.

Smart speakers can compile information in an overt way, with the user's permission, but also in a covert way, using microphones. Thus, these devices learn from the user's daily activities. Hence, the following questions arise: Can the benefits of disclosing information overcome the risks involved in using the smart device? Do consumers perceive risks associated with disclosing information? As the use of these devices is becoming increasingly frequent, and since they have multiple functionalities, it is important for firms to understand the ways in which consumers interact with them. An important research line in voice assistants and chatbots examines how to reduce the privacy risks associated with the constant surveillance of smart devices (Pflnager and Mocchi, 2020; Frick et al., 2021). Benlian et al. (2019) suggested, for example, that humanisation can reduce perceived intrusiveness. Smart home speakers can increase the integration of humanisation elements, such as human-like tone and pacing (López et al., 2017). Some researchers have found that humanising the assistant's voice can lead to greater social presence and trust in the virtual assistant, which can influence final recommendations within firms (Chérif and Lemoine, 2019).

Humanising smart technologies helps them to be viewed as trustworthy (Foehr and Germelmann, 2020) and to foster a more positive attitude towards advice provided by the smart device (Martin et al., 2020). However, human-like robots or devices may elicit negative feelings in consumers – a phenomenon previously studied using uncanny valley theory. We propose to extend this theory to human-like characteristics of smart home speakers (Burleigh et al., 2013), analysing their influence on the trade-off between the benefits and risks of personalisation. This research has two aims. First, it seeks to verify the personalisation–privacy paradox in this new context through privacy calculus theory. Second, it examines the direct and moderating role of humanisation in the personalisation–privacy paradox. To meet these objectives, the research uses a survey completed by 360 users of smart home speakers.

This article offers two main contributions to previous research. First, the examination of the privacy calculus lens in the context of receiving personalised messages from smart home speakers. Our results do not offer support for the privacy paradox, as users in our study were not found to perceive any risk of disclosing information. The current research adopts a different perspective compared to that of previous studies. Rather than analysing this paradox with respect to the pre-purchase stage, the present research considers it from the perspective of the user having had the chance to experience the service provided by the smart home speaker – that is, with respect to the post-usage stage. As a consequence of considering this post-usage stage, this study accounts for the fact that the value of personalisation is obtained through receiving personalised messages and information, not just by the willing disclosure of information, but also via covert gathering of additional data by smart home speakers from the user's daily use of the device. Thus, the user may not be conscious of all the information collected by the device, but may value the convenience, reliability, and usefulness of the information it provides.

The second contribution of this research is that it offers evidence of how the level of perceived humanisation of the smart speaker can increase the benefits and/or reduce the risks associated with disclosing personal information. Furthermore, our findings provide new evidence on how the humanisation of smart devices can influence the personalisation–privacy paradox.

The remainder of this paper is organised as follows. Next, the two main theories used in the proposed model are outlined. The hypotheses are then presented, together with the proposed model. The methodology is then detailed, followed by the results. Finally, the main results, contributions, implications, and limitations are discussed.

2. Personalisation–privacy paradox

Privacy benefits refer to the smart home speaker's "*ability to provide content and services that are tailored to individuals based on knowledge about their preferences and behaviour*" (Hagen et al., 1999). Consumers are often willing to disclose personal data in exchange for benefits, such as time savings, convenience, access to special offers, or tailored services (Bandar et al., 2020; Gironda and Korgaonkar, 2018; Jai and King, 2016; Kim and Kim, 2018; Xu et al., 2011). In the context of the IoT, privacy is a major concern among users. The perceived privacy risk is "*the degree to which individuals believe there is a potential loss associated with the release of personal information*" (Zhu et al., 2017, p. 428). This dichotomy is known as the personalisation–privacy paradox (Acquisti, 2004; Norberg et al., 2007).

Under this theoretical framework, users rationally assess the difference between costs and benefits, and use this calculation as a basis for decision making. This is known as privacy calculus theory (Culnan and Armstrong, 1999), which postulates that consumers determine their final behaviour based on a trade-off between the benefits of disclosing personal information and the costs or risks associated with doing so (Dinev and Hart, 2006; Xu et al., 2011). Within this calculation, factors such as personalisation, usefulness, or social benefits tend to override the effect of perceived risks (Wang et al., 2016). Culnan and Armstrong (1999) applied privacy calculus theory in the information systems field. They argued that, in the context of product and service purchasing, individual decision processes prior to the disclosure of personal information involve a privacy calculation. Consumers are more willing to allow the disclosure of personal information when they are informed about the company's practices and perceive that the deal in question is fair. Dinev and Hart (2006) proposed an extended model by considering the willingness of an individual to disclose personal information in online transactions. Recent research has applied privacy calculus theory to explain the intention of consumers to disclose personal information in various contexts, such as e-commerce (Zhu et al., 2017), social commerce (Sharma and Clossler, 2014), and mobile applications (Xu et al., 2011), focusing on the final decision of whether to disclosure information.

3. Development of hypotheses

3.1. The paradoxical relationship between personalisation and privacy

This study takes the definition of personalisation as being the extent to which services offered by providers are based on consumers' preferences, tastes, personal behaviour, or geographical location (Sheng et al., 2008). Smart home speakers, through the information collected or disclosed by users, can offer personalised responses when the user asks a question or for a recommendation about a product or service. Additionally, smart home speakers can proactively respond to customers' needs (Holtrop et al., 2017). For basic tasks, users can access benefits such as waking up to their favourite music, selecting specific news depending on their interest, or receiving shopping list suggestions based on information obtained from their fridge. Therefore, similar to previous research, personalisation provides relevant information and recommendations to consumers that can help to increase their well-being, improve their decision making, help them perform tasks more quickly, and improve their life and/or work (Gironda and Korgaonkar, 2018; Kim and Han, 2014; Kim et al., 2019; Xu et al., 2011). Similarly, Poushneh (2021) suggested that consumers rely on voice assistants since these devices "*help consumers to perform tasks by providing effective, efficient, and reliable information*" (p.5) based on disclosed preferences or needs. Therefore, personalisation enables consumers to see the benefits of

disclosing information. Consequently, we propose:

H1: *Personalisation of the information provided by a smart home speaker positively influences perceived benefits of disclosing information.*

Smart speakers automatically react to users' voices and collect information from the environment. This information can be used for personalisation but can also be shared with third-party service providers (Mani and Chouk, 2017), raising concerns about data security (Keh and Pang, 2010). A loss or breach of privacy represents a significant consumer cost. This is because smart products can collect a large amount of information, through sensors and microphones, including very personal information. Privacy invasion, intrusiveness, and misuse of information are the main risks that this type of technology poses (Benlian et al., 2019; Mani and Chouk, 2017).

Previous research has found that higher levels of personalisation of products or services involve certain privacy risks, as a large amount of personal and private information needs to be collected to carry out such personalisation (Kim et al., 2019; Lee and Rha, 2016; Xu et al., 2011). Thus, we propose:

H2: *Personalisation of the information provided by a smart home speaker positively influences perceived risks of disclosing information.*

Privacy calculus theory states that consumers perform a cost– or risk–benefit analysis of the motivational factors that allow or prevent the disclosure of information. Therefore, the perceived value is the result of this global estimation. Previous research (Morosan and DeFranco, 2015; Xu et al., 2011; Zeng et al., 2020) defined the perceived value of disclosing information as the individual's overall assessment of the benefits they obtain from such disclosure compared to the level of privacy compromised.

The group of utilitarian benefits previously detailed, such as the ability to perform multiple tasks more efficiently, or save time and costs, will cause an increase in the value that users perceive from disclosing information to these devices. Through the privacy calculus lens, the net value can be increased by increasing the benefits. This corresponds with the findings of previous research (Adapa et al., 2020; Morosan and DeFranco, 2015; Xu et al., 2011). Therefore, we propose:

H3: *Perceived benefits of disclosing information positively influence the perceived value of such disclosure.*

Another way to influence perceived value is through costs. Previous research has suggested that perceived risk can be considered as a cost with respect to value perceptions (Sweeney et al., 1999) that has a negative effect on perceived value for the user (Adapa et al., 2020; Sweeney et al., 1999; Teng and Lu, 2010). Similarly, Yang et al. (2012) determined that perceived risk has a negative effect on perceived value, while Yu et al. (2017) asserted that if individuals perceive risks associated with a product to be high, their valuation of the product will decrease. In the context of privacy risk, some opportunistic behaviours to collect data or to misuse the information obtained may occur, such as selling personal data or disclosing personal information to third parties (Malhotra et al., 2004; Frick et al., 2021). Combined with the risk of monitoring or hacking that information, these constitute risks that users must assume, decreasing the perceived value of disclosing information (Xu et al., 2011). Therefore, we propose:

H4*: Perceived risks of disclosing information negatively influence the perceived value of such disclosure.*

3.2. Consequences of the personalisation–privacy paradox

Intention to continue usage comprises a decision that is made by an individual to use an application beyond the initial adoption (Chen and Lin, 2015). Previous research has found a positive relationship between value and attitude (Kim et al., 2017), and between value and use intention in different contexts, such as digital music or blogs (Chen and Lin, 2015; Turel et al., 2010), and in the context of smart products and smart home services (Hong et al., 2017; Kim et al., 2017; Yang et al., 2016). Such research has found a significant effect between the perceived value of such products and the intention to continue using them. A positive perception of the value of personalisation means that the benefits outweigh the costs, such that it makes sense to continue using the product. Thus, we propose:

H5: *Perceived value of disclosing personal information via a smart home speaker positively influences the intention to continue to use the speaker.*

3.3. Humanisation

Previous research has used anthropomorphising as a synonym of humanisation and defined it as the process of attributing human-like characteristics, such as "*mind, intentions, effortful thinking, emotional states, and behavioural features, to non-human objects, entities, or animals*" (Puzakova et al., 2013, p. 82). Companies have focused on identity and conversational characteristics to humanise today's smart home assistants, giving them names and providing them with human responses, such as jokes and original answers (Go and Sundar, 2019). Two main research streams have sought to explain the effects of the humanisation of smart home assistants on consumers' cognitive appraisals, emotions, and behaviour: realism maximisation theory and uncanny valley theory (Groom et al., 2009; Yee et al., 2007).

In line with realism maximisation theory, we propose a positive effect of humanisation on perceived benefits. Humanisation is assumed to provoke more positive behavioural and emotional reactions in consumers (Bavaresco et al., 2020; Qiu and Benbasat, 2009). Features of human personality increase individuals' perception that they are interacting with another human being, which increases their satisfaction with the device (Waytz et al., 2010; Lee and Oh, 2021). Furthermore, they improve users' attitudes towards the assistants' advice and recommendations (Foehr and Germelmann, 2020; Martin et al., 2020), increase the credibility of messages received (Foehr and Germelmann, 2020; Qiu and Benbasat, 2009), and make people perceive the device as more useful, thereby increasing their perception of control and benefits received (Poushneh, 2021).

Uncanny valley theory proposes a cubic effect of humanisation on emotional and cognitive reactions, and it is useful to consider its effect on perceived risks (Cheetham, 2017; Mathur et al., 2020; Mori, 1970). By increasing the human-like appearance or behaviour of a robot or virtual assistant, people may experience greater affinity therewith (Rosenthal-von der Pütten and Krämer, 2014; Zlotowski et al., 2015). However, certain degrees of greater realism may be perceived as eerie and unsettling, inducing a negative effect characterised by distress and weirdness (Cheetham, 2017). As human-likeness continues to increase, the object becomes almost identical to humans, becoming more likeable, increasing empathy, and improving people's emotional and attitudinal reactions to it (MacDorman, 2019; Mathur et al., 2020).

Smart home speakers can be perceived as having human characteristics, but they cannot resemble perfect humans, so this theory predicts a quadratic effect. Human-like characteristics may be positively perceived and reduce costs until a point; after this point they can be unsettling and disturbing, generating feelings of fear and distrust (Mathur et al., 2020). Humanisation can diminish perceived costs since it can attenuate privacy risks derived from a greater trust, familiarity, and social presence with the device (Benlian et al., 2019; Foehr and Germelmann, 2020; Poushneh, 2021; Sheehan et al., 2020). However, greater humanisation can lead to increased worries about information privacy (Ford and Palmer, 2018). A human-like voice that is not actually human creates confusion about the humanity of the device. This can generate distrust in smart home speakers, diminishing the purchase intention of users through this type of device (Strait et al., 2017; Xie et al., 2020).

Furthermore, smart home speakers can seem more human by appearing to show their own mind and will, which can reflect greater autonomy in their decisions and actions. This may lead to the individual's perception that they will lose control over the device, increasing feelings of eeriness (Stein and Ohler, 2017; Xie et al., 2020). Therefore, we propose:

H6: *Humanisation of a smart home speaker will positively influence perceived benefits of disclosing personal information.*
H7: *Humanisation of a smart home speaker will have a U-shaped effect on perceived risks of disclosing personal information.*

3.4. Moderating effect of humanisation

Due to voice interaction between users and smart home speakers, the effect of personalised messages on the benefits and risks of disclosed information can vary depending on how this interaction is developed. Smart speakers can be humanised through a human-like tone and pacing (López et al., 2017), and even a sense of humour that is added to the device. Another important anthropomorphic aspect is responsiveness, which refers to the smart speaker's ability to provide users with quick and effective responses (Bavaresco et al., 2020). As a consequence, greater humanisation could increase users' perceptions of responsiveness, which can increase the usefulness of messages received. Furthermore, humanisation helps consumers create an emotional tie with the device, thereby increasing trust. This, in turn, increases the credibility and usefulness of the personalised information and recommendations or suggestions provided by the device (Chérif and Lemoine, 2019).

Regarding the relationship between personalisation and perceived privacy risk, we propose a negative moderating effect of humanisation – that is, we propose that humanisation will decrease risk perceptions due to the presence of personalisation. Humanisation can increase feelings of familiarity with the device, so users may be less worried about the information disclosure needed for the device to personalise its services (Benlian et al., 2019). Furthermore, humanisation leads to entertainment and enjoyment in the interaction with the device (Xie et al., 2020), which can reduce the biased negative perceptions about the risks associated with the disclosure of information needed for personalisation. Therefore,

H8a:*Humanisation of a smart speaker will strengthen the effect of personalisation on perceived benefits of disclosing personal information.*
H8b*: Humanisation of a smart speaker will reduce the effect of personalisation on perceived risks of disclosing personal information.*

Fig. 1 shows the theoretical model proposed.

4. Methodology

The research hypotheses were tested against data collected using a survey questionnaire administered via the Mechanical Turk. Initially, 450 responses were obtained. We eliminated some questionnaires because the respondents used more than one smart home speaker, followed a pattern in the answers, or incorrectly responded to a control question. This yielded a total of 360 valid responses.[1]

Measurement of the variables was carried out in line with previous research (see Appendix 1). All constructs were reflective and measured using a seven-point Likert scale, from 1 = "completely disagree" to 7 = "completely agree".

The dependent variable, continued usage, was formed of three items based on previous research (Bhattacherjee, 2001; Han and Yang, 2018). Personalisation was adapted from Kim and Han (2014). The perceived costs construct included aspects about intrusiveness and privacy risks, again as shown in previous research (Lee and Cranage, 2011; Xu et al., 2011). Perceived benefits was formed of five items adapted from Sun et al. (2015) and Hsu and Lin (2016). Perceived value was measured with three items proposed by Xu et al. (2011). Finally, humanisation comprised five items based on previous research (Epley et al., 2007; Lu et al., 2019).

Additionally, control variables were included: education was a categorical variable comprising four levels; gender was a dummy variable (male 1/female 0); and income categories were based on previous and similar research (Min et al., 2019).

Common method variance can pose serious problems in studies such as the present one. Therefore, Harmon's one-factor test was conducted for the whole sample. According to the results, one factor explicated 30.68% of the variance; when all factors in the model were considered, the explained variance increased to 68.01%. Thus, there was no indication of any problem with common method variance.

5. Results

5.1. Descriptive results

Table 1 shows the descriptive results of the sample. Of the respondents, 67.78% were male, 56.39% were graduates, and 51.11% were clustered around middle income levels of between $40,000 and $79,999. In addition, 46.11% said they used their smart home speaker almost every day. From the brands proposed in the survey, 62.50% owned an Alexa (Amazon), followed by 26.94% who owned Google Home (Google).

5.2. Measurement model validation

An exploratory factor analysis was carried out using SPSS software to check the dimensionality of the reflective constructs. The confirmatory factor analysis was conducted using the SmartPLS 3.0 software, revealing six constructs. Those indicators with factor loadings lower than 0.5 were eliminated (Carmines and Zeller, 1979) (see Table 2).

Additionally, Cronbach's alpha values and the composite reliability index for all constructs exceeded the minimum of 0.7 (Bagozzi and Yi, 1988; Nunnally, 1978), confirming internal consistency. The values of average variance extracted (AVE) were above 0.5 for all the latent variables, confirming convergent validity (Fornell and Larcker, 1981). Discriminant validity was evaluated through Fornell and Larcker's (1981) criterion and the heterotrait–monotrait ratio (HTMT ratio) (Henseler et al., 2015). The square roots of the AVE were higher than the correlations between pairs of constructs (Table 3), and the HTMT ratios were below the threshold of 0.875 for all latent variables. These criteria confirm discriminant validity.

5.3. Hypotheses testing

The model was estimated by applying Structural Equation Modelling (SEM) using the software SmartPLS 3.0. To test predictive relevance, this software provides the Q^2 proposed by Stone–Geisser (Geisser, 1974; Stone, 1974). According to the results, the Q^2 measures were adequate (Benefits = 0.263; Continued usage = 0.225, Perceived Value = 0.359, Risk = 0.078).

The results (Fig. 2) suggest that personalisation of a smart home speaker has a direct, positive, and significant effect on the perceived benefits of using the speaker, supporting H1. However, H2 is not supported as it shows a non-significant relationship between personalisation and perceived risks. The perceived benefits of disclosing information have a positive and significant effect on perceived value, supporting H3; while risks of disclosing information have a negative and significant effect, supporting H4. There is a positive and significant

[1] A common concern in using Mechanical Turk is that not every survey-taker is unique. We addressed this concern in two ways in our data processing. First, we set up Mechanical Turk so that each respondent was asked to complete a single survey; second, we checked that no responses had identical Mechanical Turk IDs.

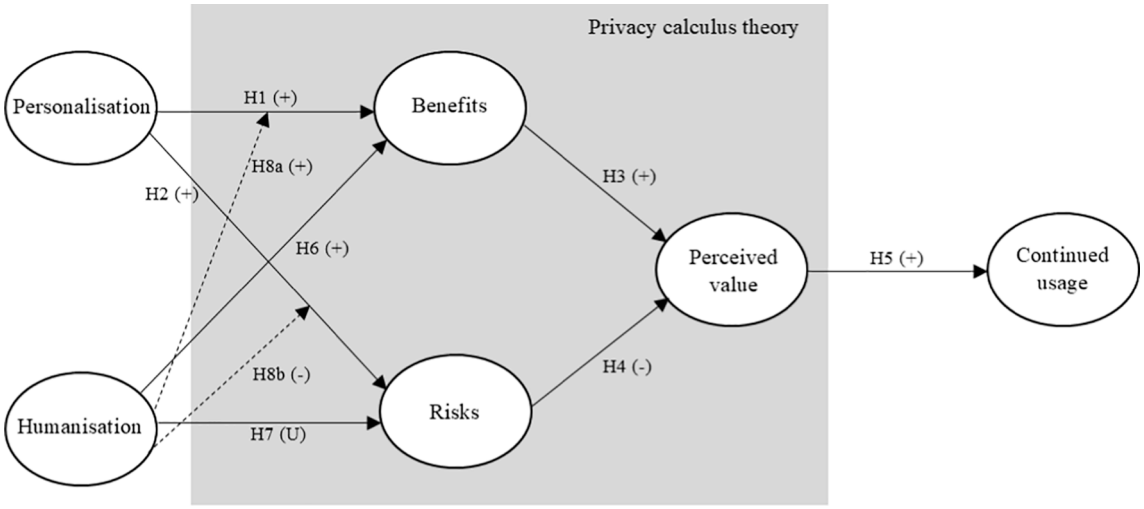

Fig. 1. Theoretical model.

Table 1
Sample characteristics.

Gender (%)		Education (%)		Frequency (%)		Brand (%)		Income (%)	
F	32.22	N	6.39	N	0.28	Alexa	62.50	<$20,000	6.39
M	67.78	C	21.67	AN	1.67	Cortana	1.67	$20,000–39,999	17.78
		B	56.39	S	32.78	Google	26.94	$40,000–59,999	26.67
		M/PHD	15.56	AED	46.11	HomePod	8.89	$60,000–79,999	24.44
				ED	19.17			$80,000–99,999	10.83
								>$100,000	12.78
								Not disclosed	1.11

Note: F, Female; M, Male; N, None; C, College; B, Bachelor; M/PHD, Master/PhD; N, Never; AN, Almost Never; S, Sometimes; AED, Almost Every Day; ED, Every Day.

Table 2
Items and measurement model.

	Loadings	Cronbach's Alpha	Composite reliability	AVE	Mean	Standard deviation
Personalisation		0.841	0.843	0.759	5.023	1.35
PERSON_1	0.887					
PERSON_2	0.867					
PERSON_3	0.859					
PERSON_4	*Deleted*					
Perceived benefits		0.879	0.880	0.673	5.003	1.346
BEN_1	0.835					
BEN_2	0.818					
BEN_3	0.825					
BEN_4	0.783					
BEN_5	0.840					
Perceived risks		0.930	0.944	0.739	4.368	1.712
RISK_1	0.830					
RISK_2	0.879					
RISK_3	0.878					
RISK_4	0.833					
RISK_5	0.857					
RISK_6	0.879					
Perceived value		0.816	0.818	0.844	4.518	1.465
VALUE_1	0.914					
VALUE_2	0.924					
VALUE_3R	*Deleted*					
Continued usage		0.830	0.834	0.746	5.371	1.123
CONT_1	0.867					
CONT_2	0.837					
CONT_3	0.886					
Humanisation		0.960	0.961	0.862	3.391	2.101
HUMAN_1	0.910					
HUMAN_2	0.928					
HUMAN_3	0.941					
HUMAN_4	0.936					
HUMAN_5	0.928					

Table 3
Discriminant validity.

	BEN	CONT	HUMAN	PERSON	RISK	VALUE
BEN	**0.820**	*0.743*	*0.291*	*0.722*	*0.075*	*0.771*
CONT	0.633	**0.864**	*0.075*	*0.546*	*0.056*	*0.513*
HUMAN	0.269	0.025	**0.929**	*0.309*	*0.385*	*0.490*
PERSON	0.622	0.458	0.277	**0.871**	*0.128*	*0.557*
RISK	0.021	0.006	0.380	0.111	**0.860**	*0.091*
VALUE	0.655	0.423	0.434	0.460	−0.046	**0.919**

Note: Values (in bold) on the diagonal are square roots of the AVE. Values below the diagonal are correlations between variables. Values above the diagonal are values of the HTMT ratio.

relationship between perceived value and continued usage, so H5 is supported. The results show a positive and significant relationship between humanisation and benefits, which supports H6. Finally, it should be noted that the results show a U-shaped quadratic relationship (Fig. 3) between humanisation and risks, supporting H7.

Related to the moderating effect of humanisation, the results indicate that humanisation increases the relationship between personalisation and benefits; therefore, H8a is supported ($b = 0.079$, $p < 0.05$). However, the moderating effect of humanisation on the relationship between personalisation and perceived risks of disclosing personal information is not significant (($b = -0.01$, $p < 0.05$), so H8b is not supported.

Fig. 4 shows the moderating effect of humanisation on the relationship between personalisation and perceived benefits. It reveals that the relationship between personalisation and benefits is positive, as indicated by the results analysed above. Furthermore, when

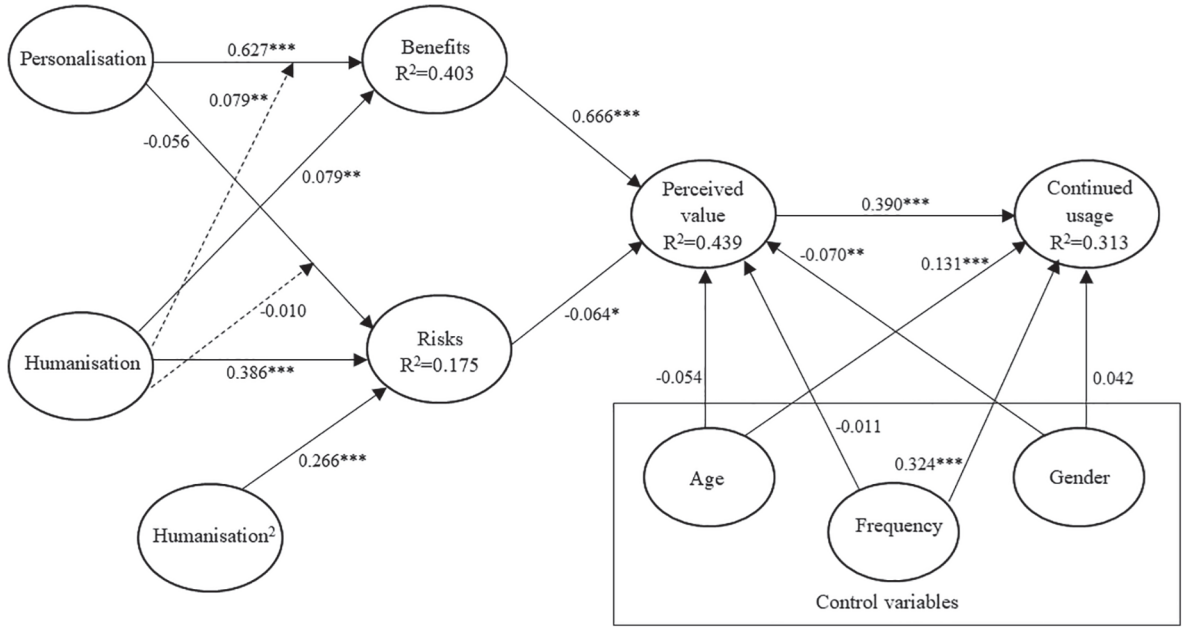

Fig. 2. Results of the structural model ***significant at 1%; **significant at 5%; * significant at 10%.

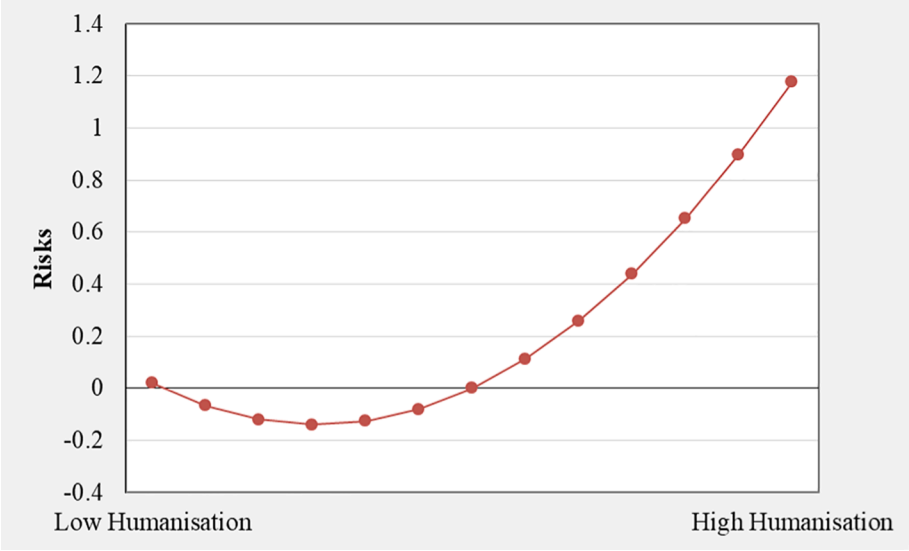

Fig. 3. U-shaped effect of humanisation on risk.

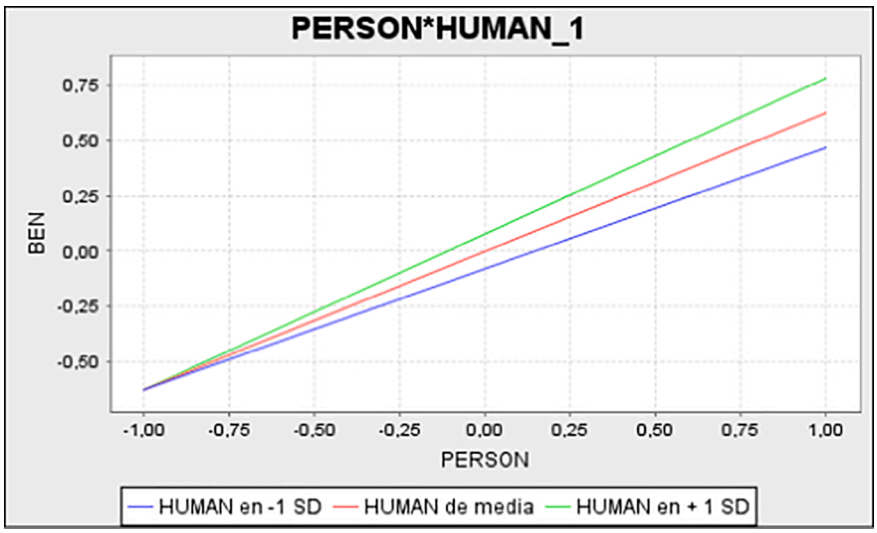

Fig. 4. Moderating effect of humanisation on the relationship between personalisation and perceived benefits.

humanisation is high (shown in green in Fig. 4), the relationship between personalisation and benefits becomes more positive, while a low degree of humanisation (shown in red) still has a positive but much weaker effect.

Regarding the control variables, only gender has a negative and significant effect on perceived value. Frequency and age show a positive and significant effect on continued usage. Thus, more frequent and older users are more likely to continue using the device. Table 4 shows the summary of the hypothesis statement.

6. Discussion

This study has two aims: first, to verify the personalisation–privacy paradox in the context of smart home speakers through privacy calculus theory; second, to examine the role played by humanisation within the personalisation–privacy paradox, proposing direct and moderating effects. Although the empirical results provided overall support for the proposed research model, they also revealed some unexpected relationships.

The results suggest that personalisation of messages improves the perceived benefits of providing information, which supports findings of previous studies (Hsu and Lin, 2016; Kim et al., 2019; Sun et al., 2015). This means that consumers are more likely to see that there are benefits to providing certain personal information if the suggestions, recommendations, and messages given by smart home speakers are relevant and tailored to them. However, the findings show that the relationship between personalisation and perceived risks from information disclosure is non-significant, contrary to our expectations and to previous literature (Gironda and Korgaonkar, 2018; Kim and Han, 2014; Kim et al., 2019).

Our results suggest that personalised messages may in some way override these privacy concerns. A possible explanation for this unexpected result could be the definition of the privacy risks construct used. We have defined privacy risks as the potential loss that individuals believe may exist from the disclosure of personal information, such as that their information may be tracked and monitored, loss of security, infringement of privacy, following previous research (Lee and Cranage, 2011; Xu et al., 2011; Zhu et al., 2017). However, some authors, such as Cazier et al. (2008; 2009) or Bhatia and Breaux (2018), suggest that privacy risks can be divided into two dimensions: privacy risk harm and privacy risk likelihood. According to this multi-dimensional concept of risks, our construct only captures privacy risk likelihood and not privacy risk harm. Therefore, it is possible that the established relationship between personalisation and risks would not be significant. In this sense, considering a concept of risk that captures perceptions of potential harm as a consequence of disclosing personal information could make respondents perceive the risk to privacy to be more real and present and could explain the unexpected results around the relationship of personalisation and risk.

Another explanation can be found in the omission of certain variables that can moderate the relationship between personalisation and privacy risks, such as the way information is collected (covert versus overt) (Xu et al., 2011), privacy assurance (Lee and Cranage, 2011), technology readiness, trust in the service provider (Lee and Rha, 2016), and consumer innovativeness (Lee, 2021). Furthermore, Xu et al. (2011) found a non-significant effect of personalisation on perceived risks of information disclosure if personal information is collected with transparency – they only found a negative effect if the information is collected in a covert way. Another possible explanation is the role of culture. Recent research has found that the privacy paradox is influenced by national culture (Liyanaarachchi, 2021). He found that Australians are not concerned about privacy, while for Asians this is a constant dilemma. Hence, culture could be a possible reason for the non-significant relationship between personalisation and privacy. Therefore, more research is needed to better understand this relationship.

As hypothesised, consumers consider the trade-off between perceived benefits and risks, so the value of providing personal information to obtain personalised messages is influenced by both benefits and risks, confirming previous research (Hsu, 2014; Sweeney et al., 1999; Teng and Lu, 2010). Furthermore, the perceived value of a smart home speaker's personalisation can increase continued use of the device, in line with previous studies (Hong et al., 2017; Kim et al., 2017). This suggests that users will continue to use these devices as long as they consider that the benefits of personalisation outweigh the risks.

Regarding the role of humanisation, a positive influence was found

Table 4
Results.

Relationship	Effect proposed	Results
H1: Personalisation → Benefits	*Positive*	*Supported*
H2: Personalisation → Risks	*Negative*	*Not supported*
H3: Benefits → Perceived value	*Positive*	*Supported*
H4: Risks → Perceived value	*Negative*	*Supported*
H5: Perceived value → Continued usage	*Positive*	*Supported*
H6: Humanisation → Benefits	*Positive*	*Supported*
H7: Humanisation → Risks	*U-effect*	*Supported*
H8a: Person*Human Benefits	*Positive*	*Supported*
H8b: Person*Human → Risks	*Negative*	*Not supported*

on perceived benefits, confirming realism maximisation theory (Foehr and Germelmann, 2020; Martin at al., 2020; Poushneh, 2021). This indicates that consumers will find the messages provided by smart home speakers more useful and credible if the speakers have a more human-like design. Additionally, we confirmed the quadratic effect that humanisation has on risks of disclosing information by verifying uncanny valley theory (Stein and Ohler, 2017; Strait et al., 2017; Xie et al., 2020). Specifically, we found a U-shaped relationship, which means that low, but increasing, levels of humanisation reduce perceived risks. However, there is a point at which higher levels of humanisation increase perceived risks. Smart home speakers can be humanised only up to a certain level. They can simulate the human voice and give human-like responses, such as answering with a joke or offering a good solution to consumer queries, even if these queries are formulated in an informal or original way. However, these devices cannot generate human facial expressions, and cannot give a real impression of being human. Consumers always know that they are interacting with a machine. As a consequence, some of the smart speakers' answers may lead to feelings of distrust and eeriness (Mathur et al., 2020; Strait et al., 2017), increasing the perceived risks in the interaction.

With regard to the moderating effects of humanisation, our findings show that high levels of perceived humanisation intensify the positive relationship between personalisation and perceived benefits. This confirms previous studies on this topic (Chérif and Lemoine, 2019; Diederich et al., 2020), and suggests that humanisation generates stronger feelings of social presence and gives credibility to the messages, thereby increasing the usefulness of the messages and recommendations. However, contrary to what has been proposed in previous studies (Benlian at al., 2019; Xie et al., 2020) the results show that this humanisation does not significantly influence the effect of personalisation on the perceived risks of information disclosure. Therefore, humanisation has a moderating role with regard to the positive effect of personalisation, but not its negative effect.

With respect to the control variables, age and daily use of the smart home speaker were found to have a positive impact on continued usage, while gender has a negative impact on perceived value. Therefore, older and more frequent users will be more likely to continue using the device, and men perceived less value of the personalisation compared to the risks of information disclosure. Some previous research has found that when balancing benefits and risks of disclosing information, males consider the benefits to a greater extent than females do, with the latter relying more on risks (Sun et al., 2015). More research is needed to better understand the different behaviour between males and females in this regard.

6.1. Theoretical implications

The contribution of this research is twofold. First, this study contributes to existing research on the personalisation–privacy paradox by providing more evidence of its application in the context of smart home speakers and examining its role in the decision of whether to continue to use these devices. This research confirms only the positive effects of personalisation, with no evidence found regarding its negative effects in terms of privacy risks. Additionally, previous research has predominantly examined users' willingness to disclose information as the main behavioural response. In this study, we provided evidence of a relationship between the value of personalisation and continued usage. Another important contribution is that while previous research has analysed this paradox in a pre-purchase stage, the present research analyses the paradox once the user has had the chance to experience the service provided by the smart home speaker. Therefore, the real value of personalisation, the benefits perceived, and the perceived risks are assessed instead of just expectations of those aspects. Users have experienced receiving personalised messages and information and have experienced the benefits of disclosing information by experiencing how the device performs some routine tasks based on their preferences or personal information. In this case, the present research found that there is a dilution of the risks of disclosing information. Consumers confirm that all the benefits from receiving personalised messages increase the value and usefulness of the information provided by the device.

Second, this study contributes by providing new evidence regarding how the humanisation of smart devices influences the personalisation–privacy paradox. Specifically, it reveals the effect of humanisation of the smart home speaker on perceived benefits, confirming that users will perceive the messages received as more useful and credible if the devices seem human. At the same time, this study verifies uncanny valley theory and confirms the U-shaped effect that humanisation has on risks of information disclosure. Previous research has focused on how humanisation influences trust or emotional reactions, but little research, with the exception of that by Benlian et al. (2019), has focused on its effects on negative aspects, such as privacy risks. Finally, this paper explored not only the direct relationship between humanisation and the personalisation–privacy paradox, but also its moderating effect. Our findings confirm the importance of humanisation only in the relationship between personalised messages and the benefits obtained from this personalisation.

6.2. Managerial implications

The findings of this study allow us to present the relevant implications to sectors seeking to use smart home assistants to interact with consumers. These include providers of smart home assistants together with firms considering the use of chatbots or virtual assistants in retail. Nowadays, consumers' interactions with retailers are shifting from personal assistance to digital assistants. These help customers online with product- or service-related information offering a customised experience (Pantano and Pizzi, 2020). According to our results, smart home speaker providers should offer users a personalised experience when using the device, since this generates greater utility, greater value, and therefore greater usage continuity. Pantano and Pizzi (2020) suggested that technology advancements in chatbots or other virtual assistants should focus on enhancing their analytical skills to automatically interact with users and to provide customised solutions. Therefore, communication campaigns on smart home speakers should highlight the benefits of disclosing information in exchange for receiving personalised information to eliminate the initial barriers related to privacy risks. Once the initial barrier is overcome, it is more likely that users of the devices will realise the multiple benefits of personalisation in exchange for disclosing information while ignoring the risks.

Additionally, designers of this technology should focus on an interface that achieves a certain degree of humanisation, while keeping it to acceptable levels. For example, smart assistants could include more natural human voices and offer more authentic responses to consumers' queries via bi-directional communication. However, this human-likeness should have a limit, since very original responses that only human beings can offer may lead to higher perceived risks. The personality that the device acquires is another aspect that gives it more humanity. By incorporating these features, the perceived benefits of using smart home speakers will increase, since such features lend credibility to the messages and increase the perceived usefulness of the devices. At the same time, both device developers and marketing managers should exercise caution regarding the level of humanisation included and perceived by consumers to avoid increasing the risks associated with incorporating an overly human appearance.

6.3. Limitations and suggestions for future research

This research is subject to several limitations that offer lines for further investigation. First, despite the reliability and representativeness provided by the Mechanical Turk portal, future research could replicate this model using a larger sample or a professional market research company to generalise the results. A second limitation is that this

research has been carried out in just one country, the United States. Therefore, future research could test the importance of humanisation in a different country, where consumers may present divergent results due to cultural effects. For example, Japanese consumers are more accustomed to dealing with humanised robots, while in other countries such as Portugal, Spain, or Greece service robots are not so common. On the other hand, people from these countries are more extrovert and communication style may be more important for them than for Japanese or Finish (Davenport et al., 2020; Kaplan and Haenlein, 2020; Manheim and Kaplan, 2019).

Third, although this article has used a one-dimensional construct of privacy risk, as has previous research, it could be interesting to use a multi-dimensional approach for this variable. This could provide more evidence of the relevance of privacy risk in the use of smart home assistants. Fourth, this research has only examined the effect of humanisation as a moderator. Therefore, future research could examine other possible moderating variables. In particular, personality characteristics could also be very interesting as extrovert consumers are more likely to interact with a device as a human. Motivation is another important aspect to consider in the model, as more hedonic use of the device's humanisation may have a different impact than utilitarian use.

To explain humanisation, this current research has used a latent variable and examined its effects on perceived benefits and risks. However, future research could use another method to analyse differences in the personalisation–privacy paradox depending on the device's level of humanisation. For example, an experimental design, in which humanisation can be manipulated, or a qualitative study, exploring consumers' attitudes towards humanised devices more deeply. Additionally, further research could consider the different human characteristics of smart home speakers and check which characteristics increase benefits without increasing risks and to what extent.

This research has found that males give more importance to benefits and females to risks. Therefore, future research could assess the risk tolerance of each type of user surveyed and, thus, draw conclusions about risk propensity or risk aversion by factors such as gender, age, or income. In the same vein, different clusters could be defined according to the aforementioned socio-demographic characteristics of the respondents in order to predict the risk tolerance that new users may have according to their characteristics or to help companies to focus their products on certain groups of users. Finally, it would be interesting to conduct more studies to ascertain whether differences occur between brands, models, or even companies.

7. Conclusion

This research examined the personalisation–privacy paradox in the context of smart home voice speakers and the role that humanisation has in that framework. The privacy paradox has been examined in other contexts such as personalised mobile advertising (Xu et al., 2011; Hayes et al., 2021). However, as the use of smart devices at home is creating a new communication channel and a new form of interaction between brands and consumers, it is important to understand their users' behaviour. With that aim, this research adopted a post-use perspective of smart home speakers that allowed us to gain first-hand insight into the users' real-life experience with these devices. Results suggest that the privacy paradox was partially confirmed, as personalisation only influences the perceived benefits of disclosing personal information and not risks.

In addition, due to smart speaker technology, characterised by the use of voice interaction and communication, humanisation is a new aspect that can influence the perceived benefits and risks of personal information disclosure as devices can simulate the human voice and provide human-like responses, sometimes even engaging in seamless communication with users. Therefore, humanisation has an important effect on the privacy paradox model. Our findings show that humanisation has a U-shaped effect on the perceived risks of disclosing personal information and a positive and direct effect on the benefits. Additionally, humanisation has a positive moderating effect on the relationship between personalisation and perceived benefits of disclosing information. This means that the positive effect of personalisation on benefits increases when perceived humanisation is high. Therefore, humanising smart home speakers' communication is a key aspect to reduce the negative effects and increase the positive effects of the privacy paradox model.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix. Measures

Latent variable	Items
Personalisation	**PER1:** The information provided by my smart home speaker is tailored to me.
	PER2: The content of the information provided by my smart home speaker is personalised.
	PER3: The information provided by my smart home speaker is personalised for my usage.
	PER4: The information provided by my smart home speaker is delivered in a timely way.
Perceived benefits	**PB1**: Disclosing information to receive personalised messages from my smart home speaker improves my living and working efficiency.
	PB2: Disclosing information to receive personalised messages from my smart home speaker enhances my effectiveness.
	PB3: Disclosing information to receive personalised messages from my smart home speaker enables me to accomplish my tasks more quickly.
	PB4: Disclosing information to receive personalised messages from my smart home speaker helps me to get useful information.
	PB5: Disclosing information to receive personalised messages from my smart home speaker is very useful for me.
Perceived risk	**PR1**: Providing the smart home speaker with my personal information would involve many unexpected problems.
	PR2: It would be risky to disclose my personal information to the smart home speaker.
	PR3: There would be high potential for loss in disclosing my personal information to the smart home speaker.
	PR4: My actions could be at the risk of being collected tracked and monitored.
	PR5: I would be at the risk of infringement of my privacy.
	PR6: There would be a high potential for loss of safety.
Perceived value	**PV1:** I think my benefits gained from receiving personalised information from my smart home speaker can offset the risks of my information disclosure.
	PV2: The value I gain from receiving personalised information from my smart home speaker is worth the information I give away.

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(*continued*)

Latent variable	Items
	PV3: I think the risks of my information disclosure will be greater than the benefits gained from receiving personalised information from my smart home speaker.
Continued usage	**CUI1:** I will frequently use the smart speaker in the future.
	CUI2: I intend to continue using the smart speaker rather than discontinue its use.
	CUI3: I will use the smart speaker on a regular basis in the future.
Humanisation	**HUM1**: My smart home speaker has intentions.
	HUM2: My smart home speaker has a mind of its own.
	HUM3: My smart home speaker has consciousness.
	HUM4: My smart home speaker has its own free will.
	HUM5: My smart home speaker experiences emotions.

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