The Uncanny Valley: The paradoxical effects of enhancing the human-likeness of customer support chatbots on perceived trust and satisfaction

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Abstract

When chatbots are used for providing customer support, it is believed that enhancing the human-likeness of chatbots by adding human-like cues may be effective for building trust and satisfaction between service providers and their customers. However, some recent studies, which employed the theory of the uncanny valley effects, imply that enhancing the human-likeness of chatbots might engender negative outcomes when consumers perceive human-like chatbots as not sufficiently representing real human properties. Specifically, this line of research suggests that perceived trust and satisfaction with customer support may be biased negatively, insofar as a negative affective state (i.e., feeling of eeriness) induced by the uncanny valley effect extends to the evaluation of chatbots performances. Nonetheless, some studies indirectly suggest that the negative effects might be mitigated when chatbots use an informal language style. To ascertain the validity of these notions in the context of human-chatbot interaction, a 2 (*Human-likeness:* Hyper-realistic x Animated avatar vs Cartoonish x Still avatar) x 2 (*Human-like voice:* Informal vs Formal language style) between-subject experiment ($N = 165$) was conducted. Results were found to support the idea that enhancing the human-likeness of a chatbot via adding hyper-realistic and animated avatars could induce a greater feeling of eeriness from its users. Subsequently, results showed that this effect biases perceived trust and satisfaction. However, results from a moderation analysis revealed that the rendering of an informal language style did not significantly moderated the feeling of eeriness. These findings demonstrate that organisations need to take a critical approach in utilising human-like chatbots. Further implications of the findings and future research on this topic are also discussed.

Keywords: chatbots, customer support, the uncanny valley effects, avatars, voice

The paradoxical effects of enhancing the human-likeness of customer support chatbots

on perceived trust and satisfaction

Offering satisfactory support to customers through efficient communication is essential for organisations as this may directly influence the profits they make in the market (Cui et al., 2017). To provide satisfactory and quick support to customers, organisations have started to implement chatbots into their customer support (Devaney, 2018). By definition, chatbots refer to "virtual assistants providing automated customer support and e-commerce guidance in a conversational manner" (Zarouali et al., 2018, p. 491).

Due to advances in artificial intelligence and machine learning technologies (Brandtzaeg & Følstad, 2017), chatbots have started to gain much interest from researchers and practitioners in various domains. These domains include, for example, e-commerce, business, education, healthcare, sports, and sales (see, e.g., Ciechanowski et al., 2019; Cameron et al., 2017; Pricilla et al., 2018). In such domains, chatbots serve various functions for providing social and emotional support, entertainment, and customer support (Brandtzaeg & Følstad, 2017). The usage of chatbots in customer support can provide several benefits for both organisations and consumers. Organisations implement chatbots into their customer support as chatbots allow organisations to provide customer support 24/7 and they could be cost-efficient (Cui et al., 2017; Devaney, 2018). On the consumers' end, chatbots could provide the benefit of increased productivity since chatbots can provide quick access to information and assistance (Brandtzaeg & Følstad, 2017).

Previous studies have demonstrated that adding human-like cues to chatbots can make the technology even more powerful for building positive brand-customer relationships (Araujo, 2018). Specifically, Go and Sundar (2019) suggested that adding human-like cues to chatbots, such as visual (e.g., avatars) and conversational (e.g., mimicking of human-like language) cues, could be effective for inducing positive user perceptions and behaviours.

Researchers have often focussed on the role of adding human-like cues to chatbots, given that the human-likeness of a chatbot is known to activate humanness heuristics (Sundar, 2008). In previous studies, humanness heuristics are known to engender positive user perceptions such as trust (Zamora, 2017) and satisfaction (Van Noort & Willemsen, 2012). Trust and satisfaction are important factors in building positive relationships between organisations and their customers (Koehn, 1996; Thusyanthy & Tharanikaran, 2017).

However, while this notion has gained much support from numerous studies (see, e.g., Hadi, 2019), another line of research conversely suggests that enhancing the human-likeness of a chatbot might induce negative effects on user perceptions when the uncanny valley effects come into play (More, 1970). The uncanny valley effects hypothesis demonstrates that a human-like entity might paradoxically induce a negative affective state when it fails to sufficiently resembles real human features (MacDorman & Chattopadhyay, 2016). In this hypothesis, a negative affective state is defined as the feeling of eeriness experienced towards human-like, yet imperfect entities (e.g., robots, chatbot). In line with this notion, the study of Shin et al. (2019) found that enhancing the human-likeness of an artificial entity (i.e., avatar) can bias the perceived trustworthiness of the entity. Subsequently, this leads perceivers to reject the entity as the uncanny valley effect activates a negative affective state. This finding suggests that enhancing the human-likeness of chatbots in the context of chatbot customer support may likewise bias user perceptions in a negative way. Nonetheless, this speculation has not been tested in the context of human-chatbot interaction.

Based on the previous findings, the current study attempts to examine the potential effects of enhancing the human-likeness of a chatbot on user perceptions such as trust and satisfaction. Guided by the uncanny valley effects hypothesis (Mori, 1970/2012), this research specifically investigates whether a) enhancing the human-likeness of a chatbot by implementing a hyper-realistic and animated avatar will engender a negative affective state

(i.e., a feeling of eeriness). Also, the current study aims to test whether b) the negative affective state activated by interacting with a human-like chatbot will subsequently bias customers' perceived trust and satisfaction negatively. Potentially, a negative affective state evoked by the uncanny valley effect might be mitigated when a chatbot uses an informal language style. Conversational human voice (CHV) is known to humanise the voice of a chatbot (Liebrecht & van Hooijdonk, 2020) and subsequently induce positive user perceptions (Go & Sundar, 2019). An informal language style is one of the categories of CHV and enhances the perception of CHV (Liebrecht & van Hooijdonk, 2020). In support of this idea, the study of Kühne et al. (2020) has found that the feeling of eeriness towards robots may be reduced when robots convey human-like, rather than machine-like, voices. In addition, humans were found to prefer a more natural voice over an artificial voice by robots, as this makes a robot less creepy (Romportl, 2014). Given the findings, this study additionally explores whether c) the rendering of an informal language style will moderate the uncanny valley effects in such a way that the use of an informal language style mitigates the feeling of eeriness. This investigation is expected to provide insights into the effective design of chatbots for eliciting positive consumer experiences.

Theoretical Framework

The development of chatbots

Research on chatbots has been conducted since 1960. The first-ever chatbot, ELIZA, was created by computer scientist and professor Joseph Weizenbaum in 1966. ELIZA has had an enormous influence on creating computer applications that are able to understand and respond to human language. ELIZA works based on specific rules, which are relatively simple. The chatbot assigns a value to each word that a user inserts into a chat. The assigned value to each word depends on the importance of that word in the sentence. Pronouns are assigned as low values, actions verbs as higher values, and the actual action as the highest

value (see Table 1 for examples). This value ensures that the user's input is converted into a question by the chatbot. The user, subsequently, is able to answer the questions. This way, the conversation continues. (Jurafsky & Martin, 2019; Debecker, 2017a).

Table 1

Examples assigned values in chatbots

Pronouns	Action verbs	Actual action
I, You, Us	Want to, Looking for	Fly away, Run away

However, the real breakthrough of chatbots was in 1995 by computer scientist and professor Richard Wallace. Wallace produced a modern version of ELIZA named ALICE, an acronym for Artificial Linguistic Internet Computer Entity (Lokman & Zain, 2010). ALICE also works on the same principles as ELIZA, where values are assigned to the user's input so that the chatbot can respond with a question. Compared to ELIZA, ALICE is able to respond to a question even though it does not understand the question (Debecker, 2017b). This can be explained by the concept of linguistic deflections. Linguistic deflections are applied when a chatbot is not able to respond to the input of a user. The chatbot then gives a canned response, which means that the response is rather vague.

In 1997, a third chatbot was introduced; Cleverbot. Cleverbot is currently the most popular and human-like chatbot and relies on feedback to communicate. This aspect makes Cleverbot different from ELIZA and ALICE, which relies on rules to respond to users. Cleverbot can simulate conversations through learning from human interaction; it uses the knowledge gained in previous conversations to improve its responses in subsequent conversations. This technique is nowadays the base for chatbots (Hill et al., 2015) and used in the experiment of the current study.

Related work

Previous research into the area of human-like chatbots has frequently been studied since the introduction of ELIZA. Human-like cues in chatbots are known to significantly affect user perceptions as well as behaviours. Araujo (2018) found that human-like cues added to chatbots contribute to building positive brand-customer relationships. This effect can be explained by earlier research that focussed on adding more human-like cues in chatbot conversation, resulting in increased social interactions towards computers and a more socially present chatbot (von der Pütten et al., 2010). Social interactions significantly influence emotional connections (Araujo, 2018), and a more socially present chatbot significantly increases users' compliance with a chatbot's request (Adam et al., 2020). Also, a human-like chatbot leads to a more positive attitude towards a chatbot as a human-like chatbot can acknowledge answers (Ischen et al., 2019). In the study of Ischen et al. (2019), the chatbot indicated that the user's answer was noted down, which may lead to a closer bond between user and chatbot and more positive attitudes towards the chatbot. The machine-like chatbot in the study was not able to acknowledge answers (Birnbaum et al., 2016).

Furthermore, multiple studies have found that human-like cues could influence user perceptions such as trust and satisfaction (see, e.g., Go & Sundar, 2019; Hadi, 2019; Neururer et al., 2018). Specifically, adding human-like visual cues could lead to more trust (Zamora, 2017) as it seems that embodied conversational agents (i.e., chatbots) are perceived as high-quality agents, which make them more likely to be trusted (Van Mulken, et al., 1999). Adding human-like conversational cues establishes and maintains relationships that were found to positively affect satisfaction (Sweetser & Metzgar, 2007; Van Noort & Willemsen, 2012). These effects can be explained by the Modality, Agency, Interactivity, and Navigability (MAIN) model, which argues that certain structural features of a media technology can influence the credibility perceptions of its users. The MAIN model demonstrates that human-

like cues manifested in technology could cognitively activate humanness heuristics. These humanness heuristics are known to influence credibility perceptions positively (Sundar, 2008). However, such cases where human-like cues engender positive user perceptions might not be the case when the uncanny valley effect comes into play.

The uncanny valley effects

The uncanny valley "predicts a negative emotional appraisal of human replicas that appear or behave not quite human" (MacDorman & Chattopadhyay, 2016, p. 190). The negative associations with these human replicas could be attributed to the perceived realism of their non-human features. This phenomenon was first found in 1970 by Masahiro Mori, a robotics professor from Tokyo, who studied people's reactions to human-like robots. For a long time, little attention was given to the uncanny valley effect but nowadays it is studied more than ever. The increased attention could be attributed to the great evolvement and implementation of new technologies, such as human-like chatbots (Mori, 1970/2012). Previous research on uncanny valley effects found that objective realism of how it should be does not always align with perceived realism, i.e., how it appears. This incongruency may engender negative effects on user perceptions as perceivers' aversive responses are activated, also referred to as a feeling of eeriness (MacDorman & Chattopadhyay, 2016). A feeling of eeriness is a negative feeling towards human replicas evoked by the uncanny valley effect (MacDorman et al., 2013).

Based on the uncanny valley effect hypothesis, researchers found that adding human-like cues to entities may backfire and induce negative user perceptions. Shin et al. (2019) studied participants' judgements of avatars of virtual social networking services (SNS) and subsequently whether they trusted the avatar and would befriend it. They found hyper-realistic avatars to have more impact on increasing a feeling of eeriness and subsequently biased user perceptions, compared to cartoonish avatars (see Figure 1). In addition, it was found that

animated avatars, compared to still avatars, also increased a feeling of eeriness. The animated

avatar in the study blinked, smiled and nodded. Hyper-realistic avatars and animacy are visual

cues that could be added to chatbots to enhance the human-likeness of a chatbot. Avatars can

thus appear human-like or machine-like, where human-like avatars can be compiled using 3D

scanning technology. Research on the effects of humanising avatars in chatbots is currently

missing. However, based on the findings of Shin et al. (2019), it is expected that the feeling of

eeriness towards chatbots avatars will increase as a result of the uncanny valley effects.

Therefore, the current study attempts to show that:

> H1: Interaction with a chatbot with a hyper-realistic and animated avatar will induce
> a greater feeling of eeriness as a result of the uncanny valley effect, as compared to
> interaction with a chatbot with a cartoonish and still avatar.

Figure 1

Hyper-realistic vs Cartoonish avatar

Note. Avatars used in the study of Shin et al. (2019).

Conversational Human Voice

The feeling of eeriness activated by enhancing the human-likeness of an avatar might

be mitigated as a result of humanising the language used in a chatbot. To humanise the

language used in chatbots, CHV can be applied (Liebrecht & van Hooijdonk, 2020). CHV is

"an engaging and natural style of organisation communication as perceived by an

organisation's public based on interactions between individuals in the organisation and individuals in public" (Kelleher, 2009, p. 177). This conversational style of communicating impact customers' satisfaction positively (Beldad et al., 2010; Kelleher 2009; Sweetser & Metzgar 2007). CHV is divided into three main categories: personalisation of the message, invitational rhetoric, and informal language (Liebrecht & van Hooijdonk, 2020). Message personalisation refers to conversational partners who are addressed by their (first)name. Invitational rhetoric is a stimulating communication style for engagement in conversation by, for example, asking at the end of a conversation if there are any further questions. The last category of CHV is an informal language style that refers to causal, everyday language and is operationalised in four conversational linguistic elements. A first element is non-verbal cues, such as emoji's, exclamation marks and overusing of punctuations. Secondly, an informal language style uses interjections, e.g., *haha* and *ohh*. Also, shortenings such as *pls* instead of *please* belong to an informal language style. The last element is abbreviations where multiple words are merged, such as *DM* for *Direct Message* (van Hooijdonk & Liebrecht, 2018).

   The study of Kühne et al. (2020) took the first steps to study the relationship between a human-like voice and the feeling of eeriness in robots. They found that aversive reactions, i.e., feelings of eeriness, towards robots decrease when a human-like voice is applied. The human-like voice in the study was perceived as trustworthy. Previous studies on human-like voices found that a human-like voice increases the likability of a voice (Baird et al., 2018) and that a more natural voice is preferred over an artificial voice by humans (Romportl, 2014). A more human-like voice makes a robot less eerie (Kühne et al., 2020). Furthermore, organisations are increasingly using an informal language style in their communication towards consumers via social media (Beukeboom et al., 2015). An informal language style is found to produce more enjoyment (Kim et al., 2019; De Cicco et al., 2020), which is known to influence satisfaction (Oliver, 1999). In addition, an informal language style increases the

perception of CHV, which positively impacts the evaluations of brands (Van Noort & Willemsen, 2012). Also, Chattaraman et al. (2019) found that a social-oriented interaction style increases satisfaction as it is characterised by using an informal language style (Verhagen et al., 2014). Their study showed that this style of interaction was perceived to be more competent and credible. In addition, the study suggests that competency and credibility build trust (Chattaraman et al., 2019).

Although several studies have been executed in the past suggesting that human-like cues in chatbots induce positive user perceptions but also trigger negative affective states, very little is known about using a human-like voice as a moderating effect to weaken eerie feelings in chatbot conversations. Nonetheless, the studies presented in this section suggest that a human-like voice could decrease eerie feelings as an informal language style positively affects user perceptions. Therefore, it is likely that the use of an informal language style will mitigate the feeling of eeriness induced by human-like avatars:

> H2: The use of a human-like voice will moderate the relationship between the chatbot's human-like avatar and the feeling of eeriness in such a way that the use of an informal language style will mitigate the feeling of eeriness.

The uncanny valley effect on trust and satisfaction

It is now well established from the findings of various studies that adding human-like cues to artificial entities can often engender positive user perceptions and behaviours (e.g., Sundar, 2008; Van Noort & Willemsen, 2012; Zamora, 2017). However, other studies which contradict such findings explain that uncanny valley effects, induced by human-like cues, could negatively bias user perceptions such as trust and satisfaction. To better understand the uncanny valley effects on user perceptions in the context of human-chatbot interaction, the constructs of trust and satisfaction are comprehensively described.

Trust is "the extent to which a user is confident in and willing to act on the basis of the recommendations, actions, and decisions of an artificially intelligent decision aid" (Madsen & Gregor, 2000, p. 1) and is essential for the adoption of new online technologies among customers (Corritore et al., 2003). If there is no trust in chatbots, customers will not accept the chatbot. Furthermore, the lack of trust harms the relationship between an organisation and its customers since trust is an essential key factor in long-term relationships (Koehn, 1996).

Satisfaction is the overall attitude consumers have towards support (Levesque & McDougall, 1996). According to Oliver (1999), it is seen as fulfilling needs, goals, or pleasurable desires. Satisfaction among customers results in several benefits for organisations, such as loyal customers who do not easily switch to competitors or buy additional products (Thusyanthy & Tharanikaran, 2017). In addition, the retention of satisfied customers leads to several advantages: "satisfied customers are less sensitive to a price change, less marketing expenditure, financial performance, higher profit, shareholder value, return on investment, positive word-of-mouth, consumer-based retailer equity, firm-based brand equity, customer loyalty, purchase intention, repeat-purchase intention, and customer retention" (p. 144). Collectively, these studies outline a critical role for perceived trust and satisfaction among customers as essential factors for the relationship between organisations and customers. However, these user perceptions of chatbots might be biased through the feeling of eeriness induced by the uncanny valley effect.

Previous research found that the human-likeness of avatars can negatively influence the trustworthiness ratings in avatars (Nowak et al., 2009; Nowak, 2004), as enhancing human-likeness in artificial entities (e.g., chatbots) negatively influences the credibility of the entity (Nowak, 2004). This effect can be explained as people perceive the features of an entity as not adequately representing real human features. Shin et al. (2019) studied the impact of the uncanny valley effect on perceived trust in SNS. They found that the uncanny valley

effect might negatively bias perceived trust, as social judgements bias the direction of prevailing affective states (Bodenhausen et al., 1994). Based on these findings, it is posited that:

> H3a: The feeling of eeriness induced, by the human-likeness of avatars, will negatively influence customers' perceived trust in the chatbot.

However, little to no research studied the possible negative effect of eerie feelings on perceived satisfaction in chatbots. A study that researched biased user satisfaction indicated that eerie feelings, attributed to human-like virtual video game characters, serve as obstacles that leave viewers less satisfied with human-like characters (Tinwell, 2009). In this study, participants had to rate clips of human-like virtual characters and real humans on the extent to which the characters were perceived as human-like and to what extent they enjoyed interacting with the characters (i.e., the extent to which they were satisfied). It is expected that human-like avatars in chatbots also evoke eerie feelings and subsequently decrease satisfaction, as both human-like features (i.e., videogame characters and chatbot avatars) are unreal entities. Guided by this finding, the following is posited:

> H3b: The feeling of eeriness, induced by the human-likeness of avatars, will negatively influence customers' perceived satisfaction in the chatbot.

Based on the previously discussed literature and the proposed hypotheses that the human-likeness of an avatar increases feelings of eeriness and subsequently engender negative user perceptions induced by the uncanny valley effect, it is posited that:

> H4a: The feeling of eeriness will mediate the effect of the human-likeness of an avatar on customers' perceived trust.

> H4b: The feeling of eeriness will mediate the effect of the human-likeness of an avatar on customers' perceived satisfaction.

Method[1]

Research design

To investigate whether a) the human-likeness of an avatar will induce a feeling of eeriness and whether b) such a negative affective state will subsequently bias customers' perceived trust and satisfaction in chatbots, a 2 (Human-likeness: Hyper-realistic x Animated vs Cartoonish x Still) x 2 (Human-like voice: Informal vs Formal language style) between-subject design was conducted. Through the experiment, it was also explored whether an informal language style would potentially moderate the effect of the human-likeness of an avatar and the feeling of eeriness. Last, the potential mediating role of the feeling of eeriness on the relationship between the human-likeness of an avatar and perceived trust and satisfaction in chatbots was studied. Figure 3 presents a visual overview of the hypotheses.

Participants

A total of 188 participants were recruited for this study. Nevertheless, 23 participants failed to pass the attention check and were deleted from the data file, resulting in 165 participants. Of these 165 participants, 66.5% ($N = 108$) were female and 34.5% ($N = 57$) were male. The average age was 29.82 ($SD = 11.75$). The majority (98.2%) of the participants were native Dutch speakers.

The participants were approached through convenience sampling as participants were recruited via the personal network of the researcher. Additionally, the Dutch company Ennatuurlijk provided participants through their client base. Ennatuurlijk is a heat providing company located in Eindhoven and has mainly Dutch customers. Therefore, the experiment was conducted in Dutch.

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[1] The present thesis shares similar experimental materials and methods with the theses of other students (Iris Ekkelenkamp, 2021; Sophia Heybrock, 2021; Ingrid Liendo Garcia, 2021; Kalliopi Pavlidou, 2021; Nhu Phong Nguyen, 2021) who were supervised under a similar research topic by the same supervisor.

Materials

In order to conduct this research, the independent variables human-likeness and the moderator human-like voice were manipulated. Human-likeness consisted of either a hyper-realistic and animated avatar or a cartoonish and still avatar. For creating the avatars, the software of Crazy Talk 8 Pro was used (Reallusion Corp, 2017). This software enables creating hyper-realistic 3D avatars through 3D scanning technology. Photos of a male human were selected and imported into the software to generate the hyper-realistic 3D avatar. Also, neutral motions such as blinking, smiling, and nodding were applied to the 3D avatar with this software. Neutral motions were rendered to make the chatbot appear naturalistic. A professional graphic designer created the cartoonish avatar as Crazy Talk 8 Pro cannot create cartoonish avatars. In Figure 2, the images of the hyper-realistic and the cartoonish avatar are presented.

Figure 2

Hyper-realistic vs Cartoonish avatar

Note. The avatars were created by the supervisor of this thesis, Dr. M. Shin (2021).

The moderator human-like voice consisted of an informal or formal language style. For the informal language style, non-verbal cues, interjections, shortenings and abbreviations were added to the chatbot. For the formal language style, those elements were not added to the chatbot. In Table 2, examples of an informal and formal language style are presented.

Table 2

Example text Informal vs Formal language style

Informal language style	Formal language style
Hey, my name is Tom. Where can I help you with? 😊	Type your question in the section below.
Brrr… That is annoying 😩 And the bottom of the heater?	Can you tell if the bottom of the heater is getting warm?

The manipulations resulted in the following four chatbot conditions: (1) hyper-realistic and animated avatar with an informal language style; (2) hyper-realistic and animated avatar with a formal language style; (3) cartoonish and still avatar with an informal language style; (4) cartoonish and still avatar with a formal language style. The chatbot prototypes were created using the online software of Landbot.io. Chatbot interactions (informal vs formal tone of voice) in English and Dutch are displayed in Appendix A.

Measures

The mediating variable, feeling of eeriness, was measured using three items on a semantic differential scale adapted from the study of Ho and MacDorman (2010). Participants had to indicate the extent to which the chatbot conversation matched one of two antonyms on the scale (e.g., reassuring – eerie). The internal consistency reliability test yielded a good result (Cronbach's alpha = .91).

The first dependent variable in this study, customers' perceived trust, was measured using the adapted construct of Al-Natour et al. (2011). Participants had to rate four statements that best described their experience on a 7-point Likert scale that ranged from *strongly disagree* (1) to *strongly agree* (7) (e.g., The chatbot is competent). This variable yielded acceptable reliability (Cronbach's alpha = .77).

The second dependent variable, customers' perceived satisfaction, was measured using the construct used in the study of Lee and Choi (2017), which was adapted from the study of

Chin et al. (1988). Participants had to rate eight statements that best described their experience with the chatbot on a 7-point Likert scale that ranged from *strongly disagree* (1) to *strongly agree* (7) (e.g., I was satisfied with the experience of using a dialogue with the chatbot to complete tasks). Again, this measure yielded good reliability (Cronbach's alpha = 0.90). See Appendix B for the measures in English and Dutch.

Next to the measures, participants had to rate their disposition to trust on a 7-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (7) (e.g., I generally trust other people). Disposition to trust was included as a control variable since it is given that people who trust easily tend to have greater trust towards others (McKnight et al., 2002). The measure of disposition to trust had good reliability (Cronbach's alpha = .89). Furthermore, a control question was assessed by asking participants to what extent they had interacted with a chatbot before. In previously conducted studies (e.g., De Cicco et al., 2020), it was found that prior chatbot experience could influence the relationship between variables.

Procedure

An online experiment was created using Qualtrics. Before starting the experiment, participants were asked to sign a declaration of informed consent. Participation was completely confidential, anonymous, and voluntary. After receiving their consent, participants were briefly instructed to complete a conversation with a chatbot. All participants were randomly assigned to one of the four chatbot conditions so that an equal distribution was reached to be able to generalise outcomes. After finishing the task, participants had to answer an attention check to verify whether they paid attention to the manipulation of the human-likeness of the chatbot (e.g., Did the chatbot use emoji's?). Next, the participants had to answer questions regarding the eeriness of the chatbot and to what extent they were satisfied with the conversation and trusted the chatbot. In addition, participants answered the control questions regarding disposition to trust and previous experience with chatbots. Subsequently,

demographic questions were asked to create a general view of the respondents. Lastly, the participants were debriefed about the true purpose of the study. Appendix C displays a complete overview of the questionnaire in English and Dutch.

Data analysis

To validate the relationships between human-likeness, a feeling of eeriness, human-like language (i.e., moderating effects on the feeling of eeriness), and customers' perceived satisfaction and trust (H1–H3), a partial least squares structural equation modeling (PLS-SEM) analysis was conducted. This method is used in this study as it is superior to other latent modelling approaches: it 1) requires a smaller sample size and 2) allows for evaluating complex causal path models (Chin, 1998). Additionally, the PROCESS Macro in SPSS (Version 26) developed by Hayes (2021) was used to test the mediation effects hypothesised in H4.

Figure 3

Research model of the expected effects
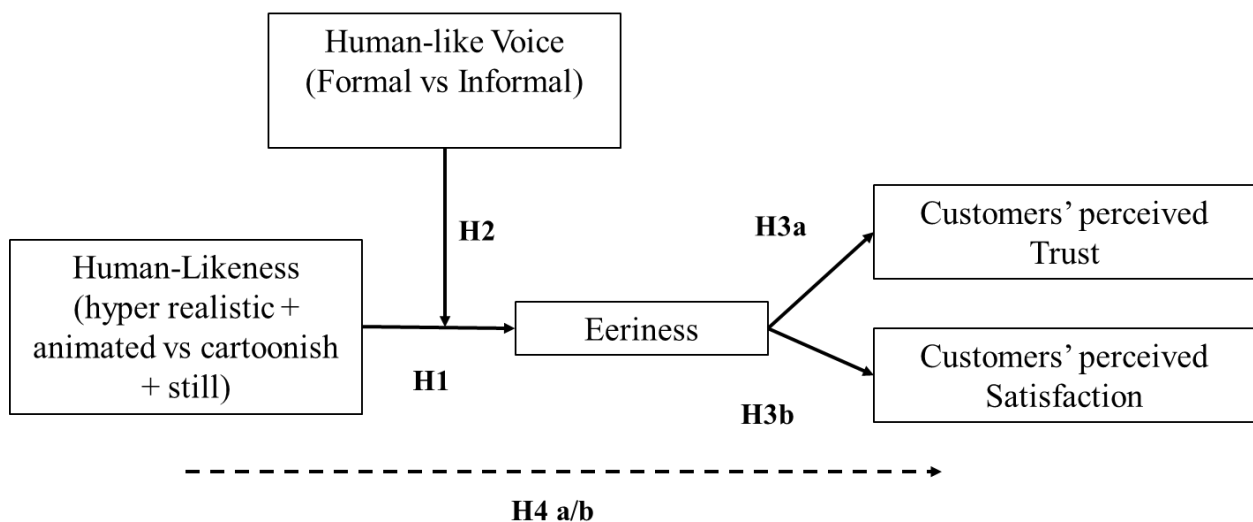
Note. Dashed line indicates the mediation hypotheses.

Results

Measurement validity

Before starting with the testing of the hypotheses, the validity of the measurement

model used in PLS-SEM was checked. According to Kock (2020), item loadings of reflective

indices greater than .50 with a significance level (i.e., p-value) below .001 in PLS-SEM

ensures that a measurement model has good reliability. In the current study, measurement

validity is ensured by the data results as all the item loadings of all constructs were found to

be greater than .50 with a significance level below .001 (see Table 3). Also, all the constructs'

internal consistency reliability was acceptable as they were higher than .70, as stated in the

measures section of the method.

Table 3

Item loadings of reflective indicators

E	IL	PT	IL	PS	IL	DT	IL
E1	.91***	PT1	.73***	PS1	0.77***	DT1	0.86***
E2	.95***	PT2	.82***	PS2	0.71***	DT2	0.87***
E3	.91***	PT3	.88***	PS3	0.75***	DT3	0.88***
		PT4	.86***	PS4	0.72***	DT4	0.80***
				PS5	0.72***		
				PS6	0.72***		
				PS7	0.78***		
				PS8	0.89***		

Note. E = Eeriness, PT = Perceived Trust, PS = Perceived Satisfaction, DT = Disposition to
Trust, IL = Item Loadings. ***p < .001

Hypotheses testing

To test the posited hypotheses from the research model (see Figure 3), a PLS-SEM analysis in WarpPLS 7.0 was conducted. H1 predicted that participants who interacted with a hyper-realistic and animated avatar (i.e., human-like chatbot) would experience a greater feeling of eeriness as compared to participants who interacted with a cartoonish and still avatar. The results of PLS-SEM indeed showed that participants who interacted with the hyper-realistic and animated chatbot ($M = 4.05$, $SD = 0.18$) reported a significantly higher feeling of eeriness than participants who interacted with the cartoonish and still chatbot ($M = 2.83$, $SD = 0.14$), $\beta = .38$, $p < .01$. In addition, human-likeness explained 15% of the variance in the feeling of eeriness ($R^2 = .15$). Thus, H1 was supported.

H2 posited that a human-like language would moderate the relationship between the chatbot's human-like avatar and the feeling of eeriness in such a way that the use of an informal language style will mitigate the feeling of eeriness. However, PLS-SEM analysis showed that this effect is not significant, $\beta = -.04$, $p = .32$. The visual human-likeness effect of the chatbot seemed to be more vigour than the moderating effect of the informal language style. Thus, H2 is not supported.

H3 hypothesised that the feeling of eeriness, induced by the human-likeness of the avatar, would negatively influence customers' perceived a) trust and b) satisfaction in the chatbot. Results showed that a feeling of eeriness indeed decreased trust ($\beta = -.32$, $p < .01$, $R^2 = .15$) and satisfaction in chatbots ($\beta = -.35$, $p < .01$, $R^2 = .13$). Thus, H3 (a/b) was supported by the results.

Next, a simple mediation analysis was performed to test H4 using PROCESS macro (Hayes, 2021) with a bias-corrected bootstrapping estimation of 5,000 replicates (Model 4). H4 predicted that the feeling of eeriness would mediate the effect of the human-like avatar of the chatbot on customers' perceived trust and satisfaction in chatbots. Results of the

mediation analysis on the effect of the feeling of eeriness on the relationship between human-likeness of the avatar and trust were found to be statistically significant, $p < .001$, B = -.31, SE = .08, 95% CIs [-.51, -.16]. Results from the mediation analysis also showed that a feeling of eeriness significantly mediated the effects of human-likeness of the avatar on satisfaction, $p < .001$, B = -.33, SE =.09, 95% CIs [-.52, -.18]. Thus, H4 (a/b) were supported by the results.

Last, it was controlled whether disposition to trust and previous experience with chatbots impacted customers' perceived trust and satisfaction in chatbots. Using the SEM-analysis, it was found that disposition to trust increased the trust in chatbots, $\beta = .15$, $p = .04$. However, results suggest that previous experience does not significantly impacted customer's trust ($\beta = .09$, $p = .12$) and satisfaction ($\beta = .05$, $p = .26$). Figure 4 shows the PLS-SEM results.

Figure 4

PLS-SEM results
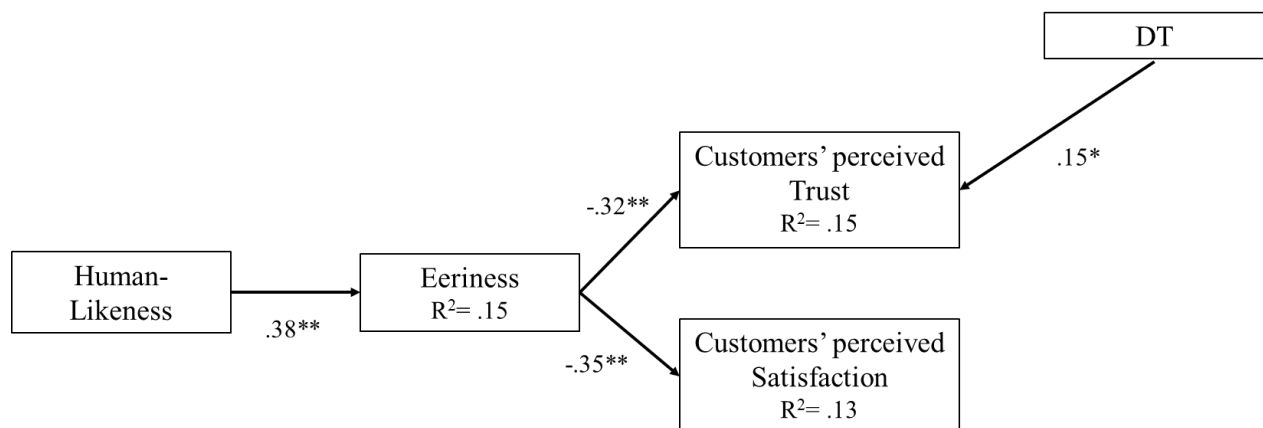
Note. Insignificant paths are not presented in the figure, DT = Disposition to Trust. * $p < .05$, **$p < .01$

Model Fit

The research model's goodness of fit was tested by checking statistics computed by WarpPLS 7.0: average path coefficient (APC), average R-squared (ARS), average block VIF (AVIF), and average full collinearity VIF (AFVIF). According to Kock (2020), APC and ARS should have a significance level below .05 ($p < .05$) and AVIF and AFVIF values should be lower than 3.3 to ensure the validity of a structural model. The PLS-SEM analysis yielded the following results: APC = .25, $p < .001$, ARS = .14, $p = .016$, AVIF = 1.04, and AFVIF = 1.35. Therefore, the validity of the current research model is supported.

Discussion and conclusion

The present study was designed to determine the effect of enhancing the human-likeness of a chatbot on user perceptions and explicitly if this induces a greater feeling of eeriness. The findings of this study support the uncanny valley effect hypothesis (Mori, 1970/2012) as it was found that a hyper-realistic and animated customer support avatar, rendered through 3D scanning technology, significantly induced a feeling of eeriness. This presumption was based on the finding of the study of Shin et al. (2019), in which the uncanny valley effect was studied in terms of judging an avatar used in a virtual SNS. Furthermore, the current study's findings are in support of the study of Seyama and Nagayama (2007), in which the degree of realism in an image and the uncanny valley effect was studied. Seyama and Nagayama (2007) showed that the uncanny valley effect could occur when the realism in an image is perceived as high. Additionally, the study of Shin, Kim, and Biocca (2019) also found that hyper-realistic and animated avatars significantly induced a feeling of eeriness.

Next, this study further investigated whether the feeling of eeriness, evoked by the uncanny valley effect, would extend to the evaluation of the chatbot and negatively bias customers' perceived trust and satisfaction. The outcomes showed that a greater feeling of eeriness indeed decreased trust and satisfaction in a chatbot. It seems that these findings align

well with previous evidence in which the incongruency between objective realism and perceived realism was found to induce negative effects on user perceptions (MacDorman & Chattopadhyay, 2016). Furthermore, this finding elaborates on previous research findings in which the effects of human-like avatars on credibility and likability perceptions are investigated. Nowak (2004) found that less human-like avatars can increase credibility and likability perceptions of users who interacted with computer agents, whereas more human-like avatars can decrease such perceptions. However, this study did not provided specific explanations of how those avatars could increase or decrease user perceptions. The findings of the current study seem to provide a theoretical explanation that uncanny valley effects had intervened in the process of evaluating artificial entities such as chatbots.

In support of the prediction of this research, results of the mediation analyses seem to support the idea that the uncanny valley effect may intervene in the process of evaluating the chatbot (e.g., Shin et al., 2019). The results showed that eerie feelings, evoked by the uncanny valley effect, negatively influenced the effect of the human-likeness of a chatbot on customers' perceived trust and satisfaction. This finding is contradictory to previous studies in which enhancing the human-likeness of chatbots induced positive user perceptions (e.g., Go & Sundar, 2019). A possible explanation for these divergent findings could be that the uncanny valley effect is not taken into consideration in previously conducted studies (e.g., Zomara, 2017).

Additionally, this study aimed to investigate the moderating effects of rendering an informal language style into a chatbot which could potentially mitigate the feeling of eeriness. As it was found in the study of Kühne et al. (2020), this study predicted that a human-like voice could decrease the feeling of eeriness. In contrast to this earlier finding, however, the current study did not find that the feeling of eeriness is mitigated after implementing an informal language style. A possible explanation for this might be that solely one component

of CHV was tested in the current study, whereas CHV consists of two more categories (i.e., personalisation of the message and invitational rhetoric). Incorporating all three components of CHV could yield a different outcome. Another possible explanation might be related to the characteristics of the stimuli used in this research. Kühne et al. (2020) focussed with their study on a humanoid robot with similar body shapes as humans, which is a different visual stimulus than the chatbots of the current study. Previous studies suggest that many other factors may influence the judgements towards visual aspects of human-like entities, such as body shapes, expressed emotions (Tschöpe et al., 2017), and gender (Kraus et al., 2018). Lastly, a possible explanation for the paradoxical outcome of H2 might be that previous research on the effects of CHV mainly focussed on adding CHV into customer support for webcare. This might have yielded different outcomes (e.g., Van Noort & Willemsen, 2012, Crijns et al., 2017).

Theoretical and practical implications

The results of this current study have theoretical as well as practical implications. The present study advances existing scholarships as it found that uncanny valley effects not only bias judgements of avatars but also that these judgements could affect the perceptions of users towards chatbots. Future research could explore whether these engendered negative user perceptions could influence brand attitude and other user perceptions. Furthermore, it yielded unanswered questions which could be addressed by further research. Questions that remain unanswered concern whether a) rendering all three categories of CHV yields different outcomes and more general b) whether there is a variable that could potentially mitigate eerie feelings in the area of chatbots.

The findings in the study have also emerged practical implications for the design of chatbots in a customer support setting. Although it was previously found that the rendering of human-like cues in chatbots would positively affect user perceptions, the current study found

contradictory findings. Using hyper-realistic avatars in customer support chatbots might not be successful in retaining customers satisfied, as it induces greater feelings of eeriness and subsequently negatively bias user perceptions. Organisations that consider applying human-like chatbots into their customer support should take a careful approach when designing a possible avatar. Additionally, the paradoxical findings of rendering an informal language style in chatbots reveal insights that should be critically assessed when it comes to adding a human-like voice into chatbots. In sum, organisations should take a critical look at humanising chatbots as, through the uncanny valley effect, it may backfire on earlier positive perceptions that users have towards the chatbot.

Limitations and future research

The current study has certain limitations which merit attention from future researchers. Firstly, a relatively specific task was given to the participants. The participants were instructed to interact with a chatbot about a malfunction in a heating system. However, this specific task might have been perceived as less involving to some participants, as it could be irrelevant or dull for the participants to interact with a chatbot about a malfunction in a heating system. However, it was chosen to implement this task as the cooperation company Ennatuurlijk is a heat-providing company that frequently receives questions about malfunctions in the heat systems. In future research, it might be possible to reproduce the current study but with another chatbot task to validate the findings. Other possible research could include questions that control for interest in a task such that these control questions would exclude participants who do not feel involved in the task's subject.

Next, the rendering of a control group was not investigated as previous research in the area of hyper-realistic avatars also did not include a control group (e.g., Shin et al., 2019). However, adding such a control group deserves further investigation by future researchers as it may provide a better understanding of the role of humanising chatbots.

Additionally, the current study has not taken other aspects from CHV into consideration, although CHV consists of more categories. Relatively few studies have previously investigated the use of conversational cues in chatbots, e.g., adding a human-like language, to counter the effects of the uncanny valley. Previous research has mainly focused on using an informal language style to increase user perceptions and thus not specifically on countering eerie feelings. Therefore, future research could consider researching more personalised and invitational communication features to discover whether this may have any impact on reducing eerie feelings.

Overall, the study found that enhancing human-likeness in customer support chatbots may backfire when the uncanny valley effect comes into play. The findings suggest that more research should be conducted on the rendering of human-like cues in chatbots. Furthermore, organisations who want to implement chatbots into their customer support should take a careful approach when adding human-like cues, as these cues can negatively bias user perceptions.

References

Adam, M., Wessel, M., & Benlian, A. (2020). AI-based chatbots in customer service and their effects on user compliance. *Electronic Markets*. https://doi.org/10.1007/s12525-020-00414-7

Al-Natour, S., Cenfetelli, R. T., & Benbasat, I. (2011). The adoption of online shopping assistants: Perceived similarity as an antecedent to evaluative beliefs. *Journal of the Association for Information Systems, 12*(5), 347-374. https://doi.org/10.17705/1jais.00267

Araujo, T. (2018). Living up to the chatbot hype: The influence of anthropomorphic design cues and communicative agency framing on conversational agent and company perceptions. *Computers in Human Behavior, 85*, 183-189. https://doi.org/10.1016/j.chb.2018.03.051.

Baird, A., Parada-Cabaleiro, E., Hantke, S., Burkhardt, F., Cummins, N., & Schuller, B. W. (2018). The perception and analysis of the likeability and human likeness of synthesized speech. *Interspeech,* 2863–2867. https://doi.org/10.21437/Interspeech.2018-1093

Beldad, A., de Jong, M., & Steehouder, M. (2010). How shall I trust the faceless and the intangible? A literature review on the antecedents of online trust. *Computers in Human Behaviour*, *26*, 857-869. https://10.1016/j.chb.2010.03.013

Beukeboom, C. J., Kerkhof, P., & De Vries, M. (2015). Does a virtual like cause actual liking? How following a brand's Facebook updates enhances brand evaluations and purchase intentions. Journal of Interactive Marketing, *32,* 26-3 http://dx.doi.org/10.1016/j.intmar.2015.09.003

Birnbaum, G E., Mizrahi, M., Hoffman, G., Reis, H. T., Finkel, E. J., & Sass, M. (2016). What robots can teach us about intimacy: The reassuring effects of robot responsiveness to human disclosure. *Computers in Human Behaviour, 63*, 416–423. https://doi.org/10.1016/j.chb.2016.05.064.

Brandtzaeg, P. B., & Følstad, A. (2017). Why People Use Chatbots. Paper presented at the *International Conference on Internet Science*, 377-392. https://doi.org/10.1007/978-3-319-70284-1_30

Cameron, G., Cameron, D., Megaw, G., Bond, R., Mulvenna, M., O'Neill, S., Armour, C., & McTear, M. (2017). Towards a Chatbot for Digital Counselling. *Conference on Human Computer Interaction.* https://doi.org/10.14236/ewic/HCI2017.24

Chattaraman, V., Kwon, W., Gilbert, J. E., & Ross, K. (2019). Should AI-Based, conversational digital assistants employ social- or task-oriented interaction style? A task-competency and reciprocity perspective for older adults. *Computers in Human Behaviour*, *90*, 315-330. https://doi.org/10.1016/j.chb.2018.08.048

Chin, J. P., Diehl, V. A., & Norman, K. L. (1988). Development of an instrument measuring user satisfaction of the human-computer interface. *Conference on Human Factors in Computing Systems*, 213-218. https://doi.org/10.1145/57167.57203

Chin, W. W. (1998). The partial least squares approach to structural equation modelling. *Advances in Hospitality and Leisure, 8*(2), 295-336.

Ciechanowski, L., Przegalinska, A., Magnuski, M., & Gloor, P. (2019). In the shades of the uncanny valley: An experimental study of human–chatbot interaction. *Future Generation Computer Systems*, *92*, 539–548. https://doi.org/10.1016/j.future.2018.01.055

Corritore, C. L., Kracher, B., & Wiedenbeck, S. (2003). On-line trust: Concepts, evolving themes, a model. *International Journal of Human-Computer Studies*, *58*(6), 737–758. https://doi.org/10.1016/S1071-5819(03)00041-7

Crijns, H., Cauberghe, V., Hudders, L., & Claeys A-S. (2017). How to deal with online consumer comments during a crisis? The impact of personalized organizational responses on organizational reputation. *Computers in Human Behavior, 75,* 619-631. https://doi.org/10.1016/j.chb.2017.05.046

Cui, L., Huang, S., Wei, F., Tan, C., Duan, C., & Zhou, M. (2017). SuperAgent: A Customer Service Chatbot for E-commerce Websites. *Association for Computational Linguistics-System Demonstrations,* 97-102. https://doi.org/10.18653/v1/P17-4017

De Cicco, R., Silva, S., & Romana Alparone, F. (2020). Millenials' attitude toward chatbots: An experimental study in a social relationship perspective. *International Journal of Retail & Distribution Management, 84*(11), 1213-1233. https://doi.org/10.1108/IJRDM-12-2019-0406

Debecker, A. (2017a). *Chatbot ELIZA: Deconstructing your friendly therapist.* https://blog.ubisend.com/discover-chatbots/chatbot-eliza#how

Debecker, A. (2017b). *A closer look at chatbot ALICE.* https://blog.ubisend.com/discover-chatbots/chatbot-alice

Devaney, E. (2018). *The State of Chatbots Report: How Chatbots Are Reshaping Online Experiences*. https://www.drift.com/blog/Chatbots-report/

Go, E., & Sundar S. S. (2019). Humanizing chatbots: The effects of visual, identity and conversational cues on humanness perceptions. *Computers in Human Behavior*, *97*, 302-316. https://doi.org/10.1016/j.chb.2019.01.020

Hadi, R. (2019). When humanizing customer service chatbots might backfire. *NIM Marketing Intelligence Review*, *11*(2). https://doi.org/10.2478/nimmir-2019-0013

Hayes, A. F. (2021). Introduction to Mediation, Moderation, and Conditional Process
Analysis (2n ed.). Guilford Press.

Hill, J., Ford, W. R., & Farreras, I. G. (2015). Real conversations with artificial intelligence:
A comparison between human-human online conversations and human-chatbot
conversations, *49*, 245-250. http://dx.doi.org/10.1016/j.chb.2015.02.026

Ho, C. C., & MacDorman, K. F. (2010). Revisiting the uncanny valley theory: Developing
and validating an alternative to the Godspeed indices. *Computers in Human Behavior*,
26(6), 1508-1518. https://doi.org/10.1016/j.chb.2010.05.015

Ischen, C., Araujo, T., Voorveld, H., Van Noort, G., & Smit, E. (2020). Privacy concerns in
chatbot interactions. *International Workshop on Chatbot Research and Design*, 34-48.
https://doi.org/10.1007/978-3-030-39540-7_3

Jurafsky, D., & Martin, J. H. (2019). Dialog Systems and Chatbots. In Speech and Language
Processing (3rd ed. Draft). https://web.stanford.edu/~jurafsky/slp3/26.pdf

Kelleher, T. (2009). Conversational voice, communicated commitment, and public relations
outcomes in interactive online communication. *Journal of Communication, 59*(1)*,
172-188. https://doi.org/10.1111/j.1460-2466.2008.01410.x

Kim, S., Lee, J., & Gweon, G. (2019). Comparing data from chatbot and web surveys: Effects
of platform and conversational style on survey response quality. *Conference on
Human Factors in Computing Systems.* https://doi.org/10.1145/3290605.3300316

Kock, N. (2020). WarpPLS User Manual (7th ed.). Laredo, TX: ScriptWarp Systems

Koehn, D. (1996). Should we trust in trust? *American Business Law Journal, 34*(2), 183–203.

Kraus, M., Kraus, J., Baumann, M., & Minker, W. (2018). Effects of gender stereotypes on
trust and likability in spoken human-robot interaction. *International Conference on
Language Resources and Evaluation*.

Kühne, K., Fischer, M. H., & Zhou, Y. (2020). The human takes it all: Humanlike synthesized voices are perceived as less eerie and more likable. Evidence from a subjective rating study. *Frontiers in Neurorobot*. https://doi.org/10.3389/fnbot.2020.593732

Lee, S., & Choi, J. (2017). Enhancing user experience with conversational agent for movie recommendation: Effects of self-disclosure and reciprocity. *International Journal of Human-Computer Studies, 103*, 95-105. https://doi.org/10.1016/j.ijhcs.2017.02.005

Levesque, T., & McDougall, G. H. G. (1996). Determinants of customer satisfaction in retail banking. *International Journal of Bank Marketing*, (*14*)7, 12-20. https://doi.org/10.1108/02652329610151340

Liebrecht C., & van Hooijdonk, C. (2020). Creating humanlike chatbots: What chatbot developers could learn from webcare employees in adopting a conversational human voice. *Chatbot Research and Design,* 51-64. https://doi.org/10.1007/978-3-030-39540-7_4

Lokman, A. S., & Zain, J. M. (2010). Extension and prerequisite: An algorithm to enable relations between responses in chatbot technology. *Journal of Computer Science*, *6*(10), 1212-1218. https://doi.org/10.3844/jcssp.2010.1212.1218

MacDorman, K. F., & Chattopadhyay, D. (2016). Reducing consistency in human realism increases the uncanny valley effect; increasing category uncertainty does not. *Cognition*, *146*, 190–205. https://doi.org/10.1016/j.cognition.2015.09.019

MacDorman, K. F., Srinivas, P. & Patel, H. (2013). The uncanny valley does not interfere with level 1 visual perspective taking. *Computers in Human Behavior,* 1671-1685. http://dx.doi.org/10.1016/j.chb.2013.01.051

Madsen, M., & Gregor, S. (2000). Measuring human-computer trust. *Conference on Information Systems.*

McKnight, D. H., Choudhury, V., & Kacmar, C. (2002). Developing and validating trust

measures for e-commerce: An integrative typology. *Information Systems Research*,

13(3), 334–359. http://dx.doi.org/10.1287/isre.13.3.334.81

Mori, M. (19702012). The uncanny valley (K. F. MacDorman, & N. Kageki,, Trans.).

IEEE Robotics and Automation, 19(2), 98-100.

https://doi.org/10.1109/MRA.2012.2192811

Neururer, M., Schlögl, S., Brinkschulte, L., & Groth, A. (2018). Perceptions on authenticity in

chatbots. *Multimodal Technologies and Interaction*, *2*(3), 60.

https://doi.org/10.3390/mti2030060

Nowak, K. L. (2004). The influence of anthropomorphism and agency on social judgement in

virtual environments. *Journal of Computer-Mediated Communication, 9*(2),

https://doi.org/10.1111/j.1083-6101.2004.tb00284.x

Nowak, K. L., Hamilton, M. A., & Hammond, C. C. (2009). The effect of image features on

judgments of homophily, credibility, and intention to use as avatars in future

interactions. *Media Psychology, 12*(1), 50-76.

https://doi.org/10.1080/15213260802669433

Oliver, R. L. (1999). Whence consumer loyalty? *Journal of Marketing*, *63*(4), 33-44.

https://doi.org/10.1177/00222429990634s105

Pricilla, C., Lestari, C.D.P. & Dharma, D. (2018). Designing interaction for chatbot-based

conversational commerce with user-centered design. *International Conference on

Advanced Informatics.* https://doi.org/10.1109/ICAICTA.2018.8541320

Reallusion Corp (2017). Crazy talk 8 pro. https://www.reallusion.com/crazytalk/

Romportl, J. (2014). Speech synthesis and uncanny valley. *International conference on Text,

Speech, and Dialogue*, 595-602.

Seyama, J., & Nagayama, R. S. (2007). The uncanny valley: Effect of realism on the impression of artificial human faces. *Presence: Teleoperators and Virtual Environments, 16*(4), 337-351. https://doi.org/10.1162/pres.16.4.337

Shin, M., Kim, S. J., & Biocca, F. (2019). The uncanny valley: No need for any further judgments when an avatar looks eerie. *Computers in Human Behavior*, *94*, 100-109. https://doi.org/10.1016/j.chb.2019.01.016

Shin, M., Song, S. W., & Chock, T. M. (2019). Uncanny valley effects on friendship decisions in virtual social networking service. *Cyberpsychology, Behaviour, and Social Networking, 22*(11). https://doi.org/10.1089/cyber.2019.0122

Sundar, S. S. (2008). The MAIN model: A heuristic approach to understanding technology effects on credibility. *Digital Media, Youth, and Credibility*, 73-100. 10.1162/dmal.9780262562324.073

Sweetser, K. D., & Metzgar, E. (2007). Communicating during crisis: Use of blogs as a relationship management tool. *Public Relations Review, 33,* 340-342. https://doi.org/10.1016/j.pubrev.2007.05.016

Thusyanthy, V., & Tharanikaran, V. (2017). Antecedents and outcomes of customer satisfaction: A comprehensive review. *International Journal of Business and Management*, *12*(4), 144-156. https://doi.org/10.5539/ijbm.v12n4p144

Tinwell, A. (2009). Uncanny as usability obstacle. *International Conference on Online Communities and Social Computing*, 622-631.

Tschöpe, N., Reiser, J. E., & Oehl, M. (2017). Exploring the uncanny valley effect in social robotics. *International Conference on Human-Robot Interaction*, 307–308. https://doi.org/10.1145/3029798.3038319

Van Hooijdonk, C., & Liebrecht, C. (2018). Wat vervelend dat de fiets niet is opgeruimd! Heb je een zaaknummer voor mij? ^EK. *Tijdschrift voor Taalbeheersing, 40*(1), 45-81. https://doi.org/10.5117/TVT2018.1.hooi

Van Mulken, S., André, E., & Müller, J. (1999). An empirical study on the trustworthiness of life-like interface agents. *International Conference on Human-Computer Interaction*.

Van Noort, G., & Willemsen, L. M. (2012). Online Damage Control: The effects of proactive versus reactive webcare interventions in consumer-generated and brand-generated platforms. *Journal of Interactive Marketing*, *26*(3), 131–40. https://doi.org/10.1016/j.intmar.2011.07.001

Verhagen, T., van Nes, J., Feldberg, F., & van Dolen, W. (2014). Virtual customer service agents: Using social presence and personalization to shape online service encounters. *Journal of Computer-Mediated Communication, 19*(*3*), 529-545. https://doi.org/10.1111/jcc4.12066

von der Pütten, A. M., Kramer, N. C., Gratch, J., & Kang, S.-H. (2010). "It doesn't matter what you are!" Explaining social effects of agents and avatars. *Computers in Human Behavior*, *26*(6), 1641-1650. https://doi.org/10.1016/j.chb.2010.06.012.

Zamora, J. (2017). I'm sorry Dave, I'm afraid I can't do that: Chatbot perception and expectations. *International conference on Human Agent Interaction,* 253-260. https://doi.org/10.1145/3125739.3125766

Zarouali, B., Van den Broeck, E., Walrave, M., & Poels, K. (2018). Predicting consumer responses to a chatbot on Facebook. *Cyberpsychology, Behaviour, and Social Networking, 21*(8), 491-497. https://doi.org/10.1089/cyber.2017.0518

Appendices

Appendix A: Stimulus materials

Table A1 Stimulus materials in English

Informal language style	Formal language style
Hey, I'm Tom. What can I help you with? 😊	Type your question/problem in the bar below.
Oops... That's not so nice. Is the radiator still getting warm?	Can you indicate whether the radiator is getting warm?
Option 1: That's good to hear! 🤩 Does the bottom of the radiator getting warm too? Option 2: Brr... 🥶 That's annoying. And the bottom?	Can you indicate whether the bottom of the radiator is getting warm?
Is the radiator leaking?	Can you indicate whether the radiator is leaking?
Is the radiator making a strange noise? 👿	Can you indicate if there is a strange sound coming from the radiator and/or pipes?
Option 1: How would you describe the sound that you hear in the radiator and/or pipes? Option 2: How bad is the radiator leaking? Option 3: Since when has the radiator stopped working well?	Option 1: Could you describe the sound that is coming from the radiator and/or pipes? Option 2: Could you indicate how bad the radiator is leaking? Option 3: Could you indicate since when the radiator stopped working properly?
Option 1: Hmm... 🤨 There seems to be too much air in the heating system. You can easily solve this by bleeding the radiator with a bleeding wrench 🔧 If the problem continues, please contact your installer or the landlord 📞 They can help you with a solution! 🛠️ Option 2: Awesomeee! 😊 Your radiator is doing exactly what it was made for. Option 3: Hmm... 🤨 Close all valves and contact your installer or landlord 📞 They can help you with a solution! 🛠️ Option 4: Hmm... 🤨 You can check if all radiators are open and whether the room thermostat is on. This should also be set high enough 🌡️ If the problem continues, please contact your installer or the landlord 📞 They will be able to help you find a solution! 🛠️	Option 1: In all probability, there is too much air in the heating system. The radiator should be bled with a bleeder wrench after which the noise should disappear. Should the problem persist, contact your installer or the landlord. Option 2: Your radiator is working properly. Option 3: Turn off all valves and contact your installer or the landlord. Option 4: Check whether all radiators are open and whether the room thermostat is on and set high enough. If the problem persists, contact your installer or the landlord.

Note. More answer options were created in case participants chose another option than stated in the instructions before chatting with the chatbot. The participants were given answer options, such as yes or no.

Table A2 Stimulus materials in Dutch

Informal language style	Formal language style
Hey, ik ben Tom. Waarmee kan ik je helpen? 😊	Typ uw vraag/probleem in onderstaande balk.
Oei... Dat is niet zo fijn. Wordt de radiator nog wel warm?	Kunt u aangeven of de radiator warm wordt?
Optie 1: Dat is goed om te horen! 🤩 Wordt de onderkant van de radiator ook warm? Optie 2: Brr... 🥶 Dat is vervelend. En de onderkant?	Kunt u aangeven of de onderkant van de radiator warm wordt?
Lekt de radiator?	Kunt u aangeven of de radiator lekt?
Maakt de radiator een vreemd geluid? 🤖	Kunt u aangeven of er een vreemd geluid uit de radiator en/of leidingen komt?
Optie 1: Hoe zou je het geluid omschrijven dat te horen is in de radiator en/of leidingen? Optie 2: Hoe erg lekt de radiator? Optie 3: Hoelang wordt de radiator al niet meer warm?	Optie 1: Hoe zou u het geluid omschrijven dat te horen is in de radiator en/of leidingen? Optie 2: Kunt u aangeven hoe erg de radiator lekt? Optie 3: Kunt u aangeven hoelang de radiator al niet meer warm wordt?
Optie 1: Hmm... 🤔 Zo te zien zit er te veel lucht in het verwarmingssysteem. Dit kun je eenvoudig oplossen door de radiator te ontluchten met een ontluchtingssleuteltje 🔧 Mocht het probleem aanhouden, neem dan aub contact op met je installateur of de verhuurder 📞 Die kan je helpen met een oplossing! 🛠 Optie 2: Superrrr! 😊 Je radiator doet precies waar die voor gemaakt is. Optie 3: Hmm.. 🤔 Draai alle afsluiters dicht en neem contact op met je installateur of de verhuurder 📞 Die kan je helpen met een oplossing! 🛠 Optie 4: Hmm.. 🤔 Je kunt nagaan of alle radiatoren opengedraaid zijn en of de kamerthermostaat aanstaat. Deze moet ook hoog genoeg ingesteld staan🌡 Mocht het probleem aanhouden, neem dan aub contact op met je installateur of de verhuurder 📞 Die kan je helpen met een oplossing! 🛠	Optie 1: Naar alle waarschijnlijkheid zit er te veel lucht in het verwarmingssysteem. De radiator moet ontlucht worden met een ontluchtingssleuteltje waarna het geluid moet verdwijnen. Mocht het probleem aanhouden, neem dan contact op met uw installateur of de verhuurder. Optie 2: Uw radiator werkt naar behoren. Optie 3: Draai alle afsluiters dicht en neem contact op met uw installateur of de verhuurder. Optie 4: Ga na of alle radiatoren opengedraaid zijn en of de kamerthermostaat aanstaat en hoog genoeg ingesteld is. Mocht het probleem aanhouden, neem dan contact op met uw installateur of de verhuurder.

Note. More answer options were created in case participants chose another option than stated in the instructions before chatting with the chatbot. The participants were given answer options, such as yes or no.

Appendix B: Survey measures

B1: Measures in English

Feeling of eeriness (Ho & MacDorman, 2010)
Choose the most appropriate answer that best describes your experience (a 7-point Semantic Differential Scale)
1. Reassuring-Eerie
2. Numbing-Freaky
3. Ordinary-Supernatural

User satisfaction (Lee & Choi, 2017)
1. I was satisfied with the experience of using a dialogue with the chatbot to complete tasks.
    1   2   3   4   5   6   7
2. I am satisfied with the chatbots recommendation service.
    1   2   3   4   5   6   7
3. Interacting with the chatbots was a pleasant and satisfactory experience.
    1   2   3   4   5   6   7
4. The dialogue with the chatbot gave me useful information.
    1   2   3   4   5   6   7
5. I am satisfied with asking the agent for information because it is easier than trying to find it myself.
    1   2   3   4   5   6   7
6. I feel that the chatbot is an expert.
    1   2   3   4   5   6   7
7. The chatbots responses in the interaction were appropriate.
    1   2   3   4   5   6   7
8. The overall assessment of conversing with the chatbot was satisfactory.
    1   2   3   4   5   6   7

Trust in the chatbot (Al-Natour et al., 2011)
Choose the most appropriate answer that best describes your experience (A 7-point Likert Scale: Strongly Disagree to Strongly Agree)
1. The Chatbot agent "Tom" is competent.
    1   2   3   4   5   6   7
2. The Chatbot agent "Tom" is benevolent.
    1   2   3   4   5   6   7
3. The Chatbot agent "Tom" has a high integrity.
    1   2   3   4   5   6   7
4. Overall, the Chatbot agent "Tom" is trustworthy.
    1   2   3   4   5   6   7

Disposition to trust (control variable)
Choose the option that best describes your personal trait (A 7-point Likert Scale: Strongly Disagree to Strongly Agree).
1. I generally trust other people.
    1   2   3   4   5   6   7
2. I generally have faith in humanity.
    1   2   3   4   5   6   7

3. I feel that people are generally reliable.

      1   2   3   4   5   6   7

4. I generally trust other people unless they give me reasons not to.

      1   2   3   4   5   6   7

Previous experience with chatbots (control variable) (De Cicco et al., 2020)

Rate your previous experience with chatbots:

1. None
2. Very limited
3. Some experience
4. Quite a lot
5. Extensive

B2: Measures in Dutch

Feeling of eeriness

De avatar leek mij: (a 7-point Semantic Differential Scale)

1. Geruststellend – Griezelig
2. Normaal – Bizar
3. Gewoon – Bovennatuurlijk

User satisfaction (A 7-point Likert Scale: Helemaal mee oneens tot Helemaal mee eens)

1. Ik was tevreden over de ervaring van het gebruik van een dialoog met chatbot Tom om taken uit te voeren.

      1   2   3   4   5   6   7

2. Ik ben tevreden over de aanbevolen oplossing van chatbot Tom.

      1   2   3   4   5   6   7

3. De interactie met chatbot Tom was een prettige en bevredigende ervaring.

      1   2   3   4   5   6   7

4. De dialoog met chatbot Tom leverde mij nuttige informatie op.

      1   2   3   4   5   6   7

5. Ik ben tevreden met het vragen van chatbot Tom om informatie, omdat het gemakkelijker is dan deze zelf proberen te vinden.

      1   2   3   4   5   6   7

6. Ik heb het gevoel dat chatbot Tom een expert is.

      1   2   3   4   5   6   7

7. De reacties van chatbot Tom in de interactie waren passend.

      1   2   3   4   5   6   7

8. De algehele beoordeling van het gesprek met chatbot Tom was bevredigend.

      1   2   3   4   5   6   7

Trust in the chatbot

Geef aan in hoeverre u het eens bent met onderstaande verklaringen (A 7-point Likert Scale: Helemaal mee oneens tot Helemaal mee eens)

1. Tom is competent.

      1   2   3   4   5   6   7

2. Tom is welwillend (een goede wil tonen).

      1   2   3   4   5   6   7

3. Tom heeft een hoge integriteit (oprechtheid).

      1   2   3   4   5   6   7

4. Over het algemeen is Tom betrouwbaar.

     1   2   3   4   5   6   7

<u>Disposition to trust</u> (control variable)

Geef aan in hoeverre u het eens bent met onderstaande verklaringen (A 7-point Likert Scale: Helemaal mee oneens tot Helemaal mee eens)

1. Ik heb over het algemeen vertrouwen in andere mensen.

     1   2   3   4   5   6   7

2. Ik heb over het algemeen vertrouwen in de mensheid.

     1   2   3   4   5   6   7

3. Ik heb het gevoel dat mensen over het algemeen betrouwbaar zijn.

     1   2   3   4   5   6   7

4. Over het algemeen vertrouw ik andere mensen, tenzij ze mij redenen geven om dat niet te doen

     1   2   3   4   5   6   7

<u>Previous experience with chatbots</u> (control variable)

Hoeveel ervaring heeft u met chatbots?

1. Geen
2. Zeer beperkt
3. Enige ervaring
4. Veel
5. Heel veel

Appendix C: Questionnaire

C1: Questionnaire in English

Part 1 - Information letter

Welcome to this study!

Thank you for your interest in participating in this study. Please read the following instructions carefully. The instructions will give you important information about the study.

What is the purpose of the study?

The purpose of this study is to investigate the role of chatbots that can increase the effectiveness of customer services.

Who can participate?

You can participate if you are 18 years or older.

What does participating in the study entail?

You will interact with a chatbot (or virtual assistant) that functions as a customer service representative. The study will take approximately 10-15 minutes to complete.

What are the benefits and risks of participating in this study?

There is minimal risk in participating in this study. There is no direct benefit to you from participating in this study. However, by participating you will contribute to the body of knowledge in the field of digital communication.

What will happen to your data?

Your participation in this study is entirely voluntary. All responses and information provided will be stored confidentially and protected with a password. We assure you that your answers will be treated completely confidentially and anonymously. You have the right to choose not to participate, not to answer any question, or to leave the study at any time and for any reason without prejudice.

Do you have any questions?

If you have any questions about the study, please contact:

Marjolijn van Lierop (c.m.h.vanlierop@tilburguniversity.edu), Master's student in Business Communication and Digital Media

Dr. Mincheol Shin (m.shin@tilburguniversity.edu), Assistant Professor at Tilburg University

Do you have a complaint?

This research has been approved by the Ethical Review Board of Tilburg School of Humanities and Digital Sciences. If you have any comments or complaints about this research, you can also contact the "Research Ethics and Data Management Committee" of Tilburg School of Humanities and Digital Sciences at tshd.redc@tilburguniversity.edu.

Part 2 - Informed consent

By checking "Yes", I confirm the following statements:

I am at least 18 years old.

I have read the information letter about the study. I have been able to ask questions about the study and think long enough about whether I want to participate in the study.

I know that participation in the study is voluntary. I can withdraw from the study at any time, without negative consequences and without having to tell anyone why I want to stop.

I know that my research data will be processed anonymously. This data is kept in a secure place with a password.

I know that anonymous research data can be used for scientific research now and in the future. The anonymous data will be examined for all participants at the same time, and not separately for me.

I know that only anonymous research data can be shared with other researchers. No personal information (e.g., my name and gender) will be collected or shared with other researchers.

I know that the coded (anonymous) research data will be kept for at least ten years.

Part 3 – Task instruction

Please read the following scenario carefully.

Put yourself in the situation where you need help regarding a radiator in your home that is not working (properly). You are going to have a conversation with Tom. Tom is the virtual assistant (chatbot) of a Dutch company that provides heat to homes that are connected to certain heat networks. You would like to know why the radiator is not working properly and what a possible solution is. First of all, you can indicate that the radiator is not working properly. Then a selection menu follows where you can indicate the following: the radiator **heats up at the top and bottom**, **does not leak**, but **makes a bubbling sound.**

Click on the link below when you are ready to start the conversation. This conversation will open in a new tab. Do not click away from the current tab! After the conversation, return here to start the questionnaire by clicking "next".

Click here to go to the chatbot.

Have fun!

Part 4 – Attention check

What applies to the conversation you just had with Chatbot Tom?

The avatar looked like:

0   Realistic

0   Cartoonish

Emoji's were used ( ):

0   Yes
0   No
0   I don't know

Part 5 – Measures

Feeling of eeriness

Reassuring	0 0 0 0 0 0 0	Eerie
Numbing	0 0 0 0 0 0 0	Freaky
Ordinary	0 0 0 0 0 0 0	Supernatural

User satisfaction
1. I was satisfied with the experience of using a dialogue with the chatbot to complete tasks.
2. I am satisfied with the chatbots recommendation service.
3. Interacting with the chatbots was a pleasant and satisfactory experience.
4. The dialogue with the chatbot gave me useful information.
5. I am satisfied with asking the agent for information because it is easier than trying to find it myself.
6. I feel that the chatbot is an expert.
7. The chatbots responses in the interaction were appropriate.
8. The overall assessment of conversing with the chatbot was satisfactory.

Trust in the chatbot
1. The Chatbot agent "Tom" is competent.
2. The Chatbot agent "Tom" is benevolent.
3. The Chatbot agent "Tom" has a high integrity.
4. Overall, the Chatbot agent "Tom" is trustworthy.

Disposition to trust
1. I generally trust other people.
2. I generally have faith in humanity.
3. I feel that people are generally reliable.
4. I generally trust other people unless they give me reasons not to.

Previous experience with chatbots
Rate your previous experience with chatbots:
0   None
0   Very limited
0   Some experience
0   Quite a lot
0   Extensive

 Part 6 – Demographic questions

What is your age in years?

[   ]

What is your gender?

0   Male
0   Female
0   Other
0   Prefer not to say

Is Dutch your native language?

0   Yes
0   No

Part 7- debriefing

Thank you for your participation! The aim of this study is to compare the effects of human-likeness in customer support chatbots with respect to user trust and satisfaction. To investigate this, you were assigned to one of four chatbot conditions: a hyper-realistic (moving features) or cartoon-like avatar that uses informal (emojis, ow..., !, awesomeee) or formal (without emojis, ow..., !, awesomeee) language.

If you have any questions about the study or its purpose, please do not hesitate to ask them via: c.m.h.vanlierop@tilburguniversity.edu

C2: Questionnaire in Dutch

Part 1 - Information letter
Welkom bij deze studie!
Bedankt voor uw interesse om deel te nemen aan deze studie. Lees alstublieft de volgende instructies aandachtig door. De instructies geven u belangrijke informatie over het onderzoek.

Wat is het doel van het onderzoek?
Dit onderzoek heeft als doel de rol van chatbots te onderzoeken die de effectiviteit van klantenservices kan verhogen.

Wie kan deelnemen?
U kunt deelnemen als u 18 jaar of ouder bent.

Wat houdt deelname aan het onderzoek in?
U gaat communiceren met een chatbot (oftewel een virtuele assistent) die functioneert als een klantenservice medewerker. Het onderzoek zal ongeveer 10-15 minuten in beslag nemen.

Wat zijn de voordelen en risico's van deelname aan dit onderzoek?
Er is een minimaal risico aan deelname aan dit onderzoek. Er is geen direct voordeel voor u verbonden aan deelname aan dit onderzoek. Door deel te nemen draagt u echter wel bij aan de kennis op het gebied van digitale communicatie.

Wat gebeurt er met uw gegevens?
Uw deelname aan dit onderzoek is geheel vrijwillig. Alle reacties en verstrekte informatie worden vertrouwelijk opgeslagen en beveiligd met een wachtwoord. Wij verzekeren u dat uw antwoorden volledig vertrouwelijk en anoniem worden behandeld. U heeft het recht om ervoor te kiezen niet deel te nemen, geen enkele vraag te beantwoorden of de studie op elk moment en om welke reden dan ook te verlaten zonder vooroordelen.

Heeft u vragen?
Als u vragen heeft over het onderzoek, neem dan contact op met:
Marjolijn van Lierop (c.m.h.vanlierop@tilburguniversity.edu), Masterstudent Bedrijfscommunicatie en Digitale Media
Dr. Mincheol Shin (m.shin@tilburguniversity.edu), Assistent Professor aan Tilburg University

Heeft u een klacht?
Dit onderzoek is goedgekeurd door de Ethical Review Board van Tilburg School of Humanities and Digital Sciences. Als u opmerkingen of klachten heeft over dit onderzoek, kunt u ook contact opnemen met de "Research Ethics and Data Management Committee" van Tilburg School of Humanities and Digital Sciences via tshd.redc@tilburguniversity.edu.

Part 2 - Informed consent
Door "Ja" aan te kruisen, bevestig ik de volgende verklaringen:

Ik ben ten minste 18 jaar oud.

Ik heb de informatiebrief over het onderzoek gelezen. Ik heb vragen kunnen stellen over het onderzoek en ik heb er lang genoeg over kunnen nadenken of ik aan het onderzoek wil deelnemen.

Ik weet dat deelname aan het onderzoek vrijwillig is. Ik kan mij op elk moment terugtrekken uit het onderzoek, zonder dat dit negatieve gevolgen heeft en zonder te hoeven vertellen waarom ik wil stoppen.

Ik weet dat mijn onderzoeksgegevens anoniem worden verwerkt. Deze gegevens worden op een veilige plaats bewaard met een wachtwoord.

Ik weet dat anonieme onderzoeksgegevens nu en in de toekomst gebruikt kunnen worden voor wetenschappelijk onderzoek. De anonieme gegevens worden voor alle deelnemers tegelijk onderzocht, en niet apart voor mij.

Ik weet dat alleen de anonieme onderzoeksgegevens kunnen worden gedeeld met andere onderzoekers. Er worden geen persoonlijke gegevens (bijvoorbeeld mijn naam en geslacht) verzameld of gedeeld met andere onderzoekers.

Ik weet dat de gecodeerde (anonieme) onderzoeksgegevens minstens tien jaar zullen worden bewaard.

Part 3 – Task instruction
Lees onderstaand scenario alstublieft zorgvuldig door.

Verplaats uzelf in de situatie waarin u hulp nodig heeft met betrekking tot een niet (goed) werkende radiator in huis. U gaat een gesprek voeren met Tom. Tom is de virtuele assistent (chatbot) van een Nederlands bedrijf dat warmte levert aan huizen die aangesloten zijn op bepaalde warmtenetten. U wil graag weten waarom de radiator niet goed werkt en wat een eventuele oplossing is. Allereerst kunt u aangeven dat de radiator niet goed werkt. Vervolgens volgt er een keuzemenu waar u het volgende kunt aangeven: de radiator wordt aan de **boven- én onderkant warm**, **lekt niet,** maar maakt een **borrelend geluid.**

Klik op onderstaande link als u klaar bent om het gesprek te starten. Dit gesprek zal openen in een nieuw tabblad. Klik het huidige tabblad niet weg! Na het gesprek keert u hier terug om de vragenlijst te starten door op "volgende" te klikken.
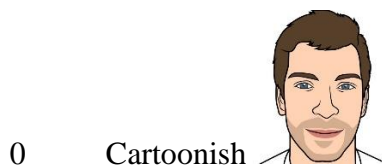
Klik hier om naar de chatbot te gaan.

Veel plezier!

Part 4 - Attention check
Wat is van toepassing op het gesprek dat u zojuist had met Tom?

De avatar zag er uit als volgt:

0   Realistisch

0   Cartoonish

Er werd gebruik gemaakt van emoji's (☺):
0   Ja
0   Nee
0   Weet ik niet

Part 5 - Measures
Feelings of eeriness

Geruststellend	0 0 0 0 0 0 0	Griezelig
Normaal	0 0 0 0 0 0 0	Bizar
Gewoon	0 0 0 0 0 0 0	Bovennatuurlijk

User satisfaction
1. Ik was tevreden over de ervaring van het gebruik van een dialoog met Tom om taken uit te voeren.
2. Ik ben tevreden over de aanbevolen oplossing van Tom.
3. De interactie met Tom was een prettige en bevredigende ervaring.
4. De dialoog met Tom leverde mij nuttige informatie op.

5. Ik ben tevreden met het vragen van Tom om informatie, omdat het gemakkelijker is dan deze zelf proberen te vinden.

6. Ik heb het gevoel dat Tom een expert is.

7. De reacties van Tom in de interactie waren passend.

8. De algehele beoordeling van het gesprek met Tom was bevredigend.

Trust in the chatbot

Geef aan in hoeverre u het eens bent met onderstaande verklaringen (A 7-point Likert Scale: Helemaal mee oneens tot Helemaal mee eens)

1. Tom is competent.
2. Tom is welwillend (een goede wil tonen).
3. Tom heeft een hoge integriteit (oprechtheid).
4. Over het algemeen is Tom betrouwbaar.

Disposition to trust

Geef aan in hoeverre u het eens bent met onderstaande verklaringen (A 7-point Likert Scale: Helemaal mee oneens tot Helemaal mee eens)

1. Ik heb over het algemeen vertrouwen in andere mensen.
2. Ik heb over het algemeen vertrouwen in de mensheid.
3. Ik heb het gevoel dat mensen over het algemeen betrouwbaar zijn.
4. Over het algemeen vertrouw ik andere mensen, tenzij ze mij redenen geven om dat niet te doen

Previous experience

Hoeveel ervaring heeft u met chatbots?

0   Geen
0   Zeer beperkt
0   Enige ervaring
0   Veel
0   Heel veel

Part 6 – Demographic questions

Wat is uw leeftijd in jaren?

[   ]

Wat is uw geslacht?

0   Man
0   Vrouw
0   Anders
0   Wil ik liever niet zeggen

Is Nederlands uw moedertaal?

0   Ja
0   Nee

Part 7 – Debriefing

Hartelijk dank voor uw deelname! Het doel van deze studie is om de effecten van menselijkheid in customer support chatbots te vergelijken met betrekking tot vertrouwen en

tevredenheid van gebruikers. Om dit te onderzoeken werd u toegewezen aan één van de vier chatbot condities: een hyperrealistische (bewegende trekjes) of cartoonachtige avatar die gebruik maakt van informele (emoji's, oei..., !, superrr) of formele (zonder emoji's, oei..., !, superrr) taal.

Als u nog vragen heeft over de studie of het doel ervan, aarzel dan niet om ze te stellen via: c.m.h.vanlierop@tilburguniversity.edu