



# **The Uncanny Valley: The human-likeness of chatbots and its paradoxical impact on consumers' purchase intention in e-commerce**

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## **Abstract**

Nowadays, people apart from physical stores visit also webstores for their purchases. Although e-commerce is not a new trend, it has gained popularity in the last five years, and it is expected to account 18% of the overall retail transactions by the end of 2021. To facilitate the customers with their online transactions, online marketers deployed chatbots to substitute for traditional sales assistants. For a better communication experience, chatbots deploy human-like characteristics that are often associated with favourable consumer behaviours. Nonetheless, they can lead to undesirable outcomes like uncanny valley effects. This study examines how the human-likeness of chatbot avatars impact customers' purchase intentions and their willingness to reuse the chatbot, drawing upon the theory of uncanny valley effects. Particularly, this study investigates to what extent chatbot humanisation (hyperrealistic-animated vs cartoonish-still) engenders feelings of eeriness and whether avatar familiarity (celebrity vs non-celebrity) will moderate the eerie feeling. Furthermore, this research takes into consideration the role of trust in the decision-making to buy the recommended product and reuse the chatbot, and how the feelings of eeriness undermine it. Results of an online experiment indicate that the humanisation of a chatbot enabled by adding a hyperrealistic avatar induced a greater feeling of eeriness and subsequently reduced the trust in the chatbot. Consequently, customers' purchase intention and willingness to reuse the chatbot were decreased as a result of the uncanny valley effects. Further implications of the findings were discussed.

*Keywords:* uncanny valley effects, e-commerce, chatbot avatar, avatar human-likeness, trust, purchase intention

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## **The human-likeness of chatbots and its paradoxical impact on consumers' purchase intention in e-commerce**

Over the last few years, chatbot technology has gained much attention from researchers and practitioners, and a growing body of literature has been dedicated to examining the social, technological and financial implications of chatbot technology. In alignment with this trend, numerous profit and non – profit organisations have started to adopt chatbots to provide efficient communication services to consumers. In general, chatbot technologies are designed to interact with customers using natural language. Natural language is often implemented in the format of written, visual and/or verbal cues (AbuShawar & Atwell, 2015). In the current market, chatbots are predominantly used to replace the traditional role of customer sales representatives (e.g. redressing service failures, execute simple tasks, namely placing orders, tracking packages, providing information) (Prasomphan, 2019). Previous research has demonstrated that chatbots can be a useful tool for e-commerce because they may potentially contribute to fostering engaging relationships between organisations and consumers (Sidaoui, 2020) and increasing their sales (Ashfaq et al., 2020).

Apart from sellers' incentives to deploy chatbot technology, researchers sought to reveal consumers' motives to engage with chatbots. Previously, cognitive and affective cues such as language style, the feeling of understanding and the agent's level of expertise (Gnewuch, 2019) were found to be significant antecedents of consumers' satisfaction. However, it has been demonstrated by previous studies that people may dislike or eschew interacting with chatbots as they seem cold, impersonal, and unfriendly (e.g., Liebrecht & Hooijdonk, 2020). To overcome this problem, developers have started to design chatbots in an anthropomorphic way (i.e.,

assigning human and social traits to virtual agents). The integration of anthropomorphic cues into virtual agents was motivated because it was found that people prefer interacting with human-like avatars as they could identify themselves better with them (Burgoon et al., 2016). Besides, the perception of similarity is known to positively influence trust and attitudes towards the anthropomorphised objects, which thereby leads to the increase in purchase intentions (Laksmidewi et al., 2017).

In practice, the humanisation of chatbots is often achieved by embedding linguistic, visual and audio cues. From the various human cues that could be conjugated to enhance the human-likeness of chatbots, anthropomorphic visual cues have gained much attention from researchers (e.g., Go & Sundar, 2019). The most prominent visual cue often employed to enhance the human-likeness is the avatar (i.e., identification figures that represent the communicator) (Nowak & Fox, 2018)). While much research has been conducted to examine the positive aspects of employing human-like chatbots for consumer services, relatively less attention has been paid to the possible negative effects of employing human-like chatbots. Intriguingly, some recent studies on human-agent interaction (e.g., Shin, Kim & Biocca, 2019) suggest that employing human-like chatbots may not always induce positive outcomes upon the activation of the *uncanny valley effects* (Mori, 1970), in which the exposure to almost authentic, yet imperfect, representation of real humans is assumed to activate a negative affective state.

In the study of Shin, Song and Chock (2019), participants who were exposed to hyper-realistic human avatars, rendered by a full-body 3D scanning technology, were found to report a greater feeling of eeriness as compared to participants who were exposed to cartoonish avatars. In addition, the study has found that such eerie feelings, induced by the uncanny valley effects, could negatively influence perceivers' trust towards an artificial yet human-like entity.

Diminishing trust can be detrimental for e-commerce because it is a fundamental predictor of business performance (Gefen, 2000). Also, trustworthy chatbot assistants are more reliable, prompting purchase intentions (Komiak & Benbasat, 2006) and willingness to reuse them in the future (Kim & Chang, 2020). Therefore, the feeling of eeriness induced by human-like yet imperfect chatbots may decrease such positive effects expected from adding human-like visual cues.

Guided by the previous studies on the uncanny valley effects, the current study attempts to investigate whether and how the uncanny valley effects will intervene in the process of influencing consumers' trust, purchase intentions, and willingness to reuse the chatbot during the interaction with human-like chatbots. In addition, some studies have provided some partial evidence that the familiarity of chatbots may mitigate the uncanny valley effects: familiar sales assistant in e-commerce was found to minimise the perceived risk and increase feelings of security to consumers.(Chu et al., 2013; Komiak & Benbasat, 2006). Given the notion, the moderating role of the familiarity of chatbot avatar will be explored to provide additional insights into whether and how increasing the familiarity of human-like chatbots via the deployment of celebrity avatars will mitigate the uncanny valley effects. In sum, the following research questions will be explored via the current study:

RQ1: Will humanising a chatbot via adding hyperrealistic visual cues negatively influence consumers' trust towards the chatbot system in the context of e-commerce due to the uncanny valley effects?

RQ2: Will the familiarity of a humanised chatbot will moderate the uncanny valley effects?

RQ3: Will the uncanny valley effects negatively influence consumers' purchase intention and willingness to reuse the chatbot in the context of e-commerce?

## **Theoretical framework**

### **Overview of Chatbots**

Chatbots, also known as disembodied conversational agents (DCA), are computer software designed to interact with people in a natural language (Gnewuch et al., 2017; Pavlikova et al., 2003). More explicitly, data mining and machine learning techniques enabled chatbots to mimic human dialogues by retrieving information from language corpora (Shawar & Atwell, 2007). Initially, developers created chatbots for entertainment purposes. The first chatbot was ELIZA (Weizenbaum, 1966), which was developed to produce human-like dialogues. ELIZA achieved to provide evidence that people can perceive a chatbot as a social actor. Notably, the participants who interacted with ELIZA attributed to it human-like characteristics and described that ELIZA showed understanding. In the following years, the advances in artificial intelligence technologies allowed the design of chatbots to serve more sophisticated purposes. Chatbots now are used for educational purposes such as learning a foreign language. Nowadays, chatbots contribute largely to the business sector by interacting with the customers and maintaining relationships with them as representatives of the brand.

More and more online retailers use chatbots to ease the communication between the brand and the consumers. Chatbots are usually text-based conversational agents that provide updated information to the consumers when they are asked (Sivaramakrishnan et al., 2007). Their role is to provide customer care by answering questions and guiding the consumers. In addition, they can be used as sales assistants in e-shopping and demonstrate to clients what

services and products are available or help them decide which are more suitable for them (Shawar & Atwell, 2007).

Notable examples of chatbot shopping assistants are the “Happy Assistant” (Chai et al., 2000) and Rita (Revolut’s Intelligent Troubleshooting Assistant), the virtual assistant of Revolut. Revolut is a financial company that provides e-banking services such as money transfers. Rita serves the role of a virtual assistant in a mobile application to “resolve the simple tasks in order to let human agents concentrate in the complex ones” (Braileanu, 2017). Indeed, online sellers find the use of chatbots as a solution to respond to the large volume of client’s routine questions and demands and facilitate them to navigate into the online shop (Faggella, 2018). To that end, chatbots consult the consumers about tasks such as shipping and return policies, package tracking and payment process. Furthermore, thanks to the advances in artificial intelligence (AI) technologies, chatbots can now have more control over interactions with consumers and execute more complicated tasks (e.g., placing orders, making reservations).

### **Chatbots in e-commerce**

There are several reasons why the demand for chatbots increases progressively in e-commerce. First of all, they offer independence to clients (Adam et al., 2020). The term independence refers to the choice of the consumer to take the initiative to address the chatbot and not the other way around. In the same vein, chatbots are seen as self-service channels by which consumers become more flexible to manage their transactions on their own. Parasuranam (1996) recognised that self-service gains importance over the years because people perceive life as more hectic and self-service channels provide more autonomy and convenience (Meuter et al., 2000). To that end, Meuter and his colleagues (2000) argue that people prefer to encounter self-service platforms than employees because they see themselves as more capable of executing personal

tasks due to previous service failures. In addition, customers select to use self-service platforms because they are time-saving and are able to find immediate solutions 24/7. Dabholkar (1992) revealed that people feel enjoyment using these channels when they are easy to use and give control to users.

Secondly, although consumers appreciate the autonomy in e-commerce, they still need personalised services and social interaction (Adam et al., 2020). In physical stores, sales assistants contribute to the increase of sales because they provide customers with personalised information about the products that interest them and use persuasive methods (Burke, 2002; Doney & Cannon, 1997). Chatbots can play a similar role in the online shopping environment by offering social support to the clients and form favourable perception regarding the quality of the vendor (Hajli, 2014). The effectiveness of chatbots as sales assistants results from their ability to simulate human dialogues and create feelings of social presence. Social presence is defined as “the salience of the other in a mediated communication” (Short et al., 1976) and explains communicators’ feeling close to each other. Eisingerich and Bell (2008) theorised that the feeling of closeness and human understanding are preconditions of satisfactory communication and effective services. Consequently, to reach the optimal similarity with the human interaction, chatbots employ human-like cues. A consequent outcome of chatbot similarity with humans is people’s tendency to respond to them as social actors. Known also as Computers as Social Actors (CASA) paradigm (Reeves & Nass, 1996), this framework describes how people mindlessly treat the technologies as real humans. For example, viewers give feedback to presenters when watching a show even though they acknowledge that the latter cannot listen. Likewise, when interacting with chatbots, users make inferences about virtual agents and portray them as likeable or sociable, attributes that typically describe human traits. Findings of several

studies (Gong & Nass, 2007; Lee, 2010; de Graaf & Allouch, 2013) identified anthropomorphism within the CASA paradigm as a significant contributing factor to chatbot's positive evaluation and, therefore, the evaluation of the brand.

Lastly, another important characteristic that augmented the demand for chatbots in e-commerce is their ability to be implemented in multiple applications and devices. A great number of chatbots can be found in social media applications such as WhatsApp, Facebook messenger, or they are integrated into brand's websites (Baez et al., 2020). Facebook with over 900 million and Whatsapp with 1.3 billion users are suitable platforms for integrating chatbots because they are highly accessible and familiar to use (Motoc, 2020). Simultaneously, a large number of customers turn to social media to request help from the brands instead of making calls to customer service (Xu et al., 2017) because they save time and money. Besides, people nowadays and especially millennials, are used to communicating with instant brief text messages via social media platforms, which also facilitates communication with chatbots.

### **Chatbot humanisation**

A major factor that contributes to the effectiveness of human and chatbot interaction is the grade of human-likeness. The explanation of this argument lies on the MAIN model (Modality, Agency, Interactivity, Navigation), which introduced the idea that messages coming from more realistic media are perceived as more credible due to the truth bias (Sundar, 2008). The perception of credibility is a result of the activation of humanness heuristics and more specifically the reasoning that what resembles best the world is more real and credible (Sundar, 2008). In that sense, more realistic chatbots seem more objective and autonomous and are seen as agents rather than technological structures (Spence et al., 2019). The human-likeness of chatbots can be distinguished into two categories: visual realism and behavioural realism. To

achieve visual realism, designers often attempt to integrate human-like visual characteristics (i.e., anthropomorphic visual cues) into technological artefacts, whereas behavioural realism concerns human qualities attributed to technologies such as non-verbal communication cues and animacy (Kang & Watt, 2013).

Humanisation or chatbot anthropomorphism can be achieved by adding human-like visual cues to the virtual agents. Visual anthropomorphism involves visual human-like cues like avatars that resemble human faces and kinesis. Avatars are graphic presentations representing the communicator in an online environment (Holzwarth, Janiszewski, and Neumann, 2006). One line of research demonstrates that people evaluate more positively human-like avatars because they perceive them as more similar to themselves (Nowak, 2013; Lee, 2007; Nowak & Fox, 2018). This perception formation explains the “like-me” hypothesis (Meltzoff, 2007) which is rooted in social cognition theory. This hypothesis postulates that people are sensitive to behaviours and appearances that are equivalent to theirs (Cross et al., 2016). On the other hand, some studies demonstrate that imperfect human-avatar similarity may cause discomfort to the users and degrade trust (Burgoon et al., 2016).

Another way of increasing anthropomorphism is via adding motions to an artificial entity (i.e., animacy). Motions are non-verbal cues that contribute to the expression of emotions. More specifically, facial expressions such as smiling, eyebrow movement and blinking are considered typical movements whereby people convey meaning. They reveal feelings that they do not communicate verbally, such as frustration and sympathy (Ekman and Friesen, 1969), and redefine the relationships of the communicators (Kang and Watt, 2013). Likewise, facial movements are also significant during communication between people and virtual agents. Media Richness Theory (Dennis and Kinney, 1998) postulates that the availability of multiple cues,

verbal and nonverbal, reduces uncertainty while the latter creates the perception of social presence and trust (Biocca et al., 2013). Nonetheless, animacy can be proven a double-edged sword because if there is inconsistency in facial motions, i.e., if expressions do not match with the content or the kinesis, it distorts avatars appearance, which may be perceived as eerie (Seyama & Nagayama, 2007).

Until now, there has been no consensus on the optimal design of chatbots. While there have been studies that suggest that human-like chatbots can be effective for building and maintaining relationships with customers (Hadi, 2019) and for increasing sales profit (Hildebrand & Bergner, 2019), another line of research suggests that the imperfect humanisation of chatbots may rather engender negative psychological consequences and evaluations when the *uncanny valley effects* (Mori, 1970) come into play. Drawing upon the theory of the uncanny valley effects (Mori, 1970), the present study aims to explore the potential role of uncanny valley effects in the context of e-commerce chatbot system.

### **Uncanny valley effects**

In the theory of uncanny valley effects (Mori, 1970), it is hypothesised that people feel uncomfortable or strange when they encounter robots that appear and behave almost human. Mori (1970) demonstrates that humans evaluate the human-like entities favourably until they notice that their human-likeness is imperfect. Then, they stop seeing them as likeable but instead describe them as eerie and unsettling. A considerable amount of literature has attempted to explain what triggers uncanny valley effects. Saygin and her colleagues (2011) proposed that uncanny valley effects can be caused by violations of brain predictions. Particularly, they explain that when people are exposed to a stimulus, e.g. a person, they associate it with a specific behaviour based on its appearance. This association is derived from the activation of stereotypes

about that stimulus. However, when this prediction of its behaviour is refuted, the brain reacts negatively. Other hypotheses explain that the feelings of eeriness and discomfort evoked by the uncanny valley effects are biological reactions and stem from psychological responses of self-protection and avoidance. Notably, when people encounter entities with abnormal physiological characteristics, they feel threatened because of the fear of pathogens (Shafer et al., 2016).

Moreover, insecurity increases because they cannot distinguish the human immediately from non-human and experience identity confusion (Ciechanowski et al., 2019). Lastly, common reasoning for the activation of the uncanny effects is the fear of death (MacDorman, 2012).

Taking into consideration the aforementioned literature, the present research defines the concept of uncanny valley effects as the feelings of eeriness and discomfort caused by the imperfect anthropomorphism and the consequent inconsistency in the realism (Shin et al., 2019; Ho et al., 2008).

The uncanny valley effects gained a lot attention in the field of human-computer interaction since technological tools are increasingly used in everyday life. Especially in e-commerce, chatbots are helpful tools for customer service because they can communicate with clients in a natural language (Sansonnet et al., 2006). However, when the uncanny valley effects come into play, the communication experience is undermined and can result in failure. Uncanny valley effects, i.e. feelings of eeriness, are consequences of the chatbot imperfect human-likeness (Mori, 1970). A common example of chatbot anthropomorphism is the implementation of a hyperrealistic avatar. Although current 3D scanning technologies allow the rendering of photorealistic avatars, they are not efficient enough to create human replicas. As a result, some avatar features may appear more realistic than others (Schwind et al., 2018). Therefore, this inconsistency of realism in the same avatar may engender categorisation confusion in the users

and evoke eeriness (Moore, 2012; Wang, 2015). Likewise, by adding anthropomorphic cues, such as hyperrealistic avatars to a chatbot, people potentially raise their expectations from the chatbot because they subsume it in the human category, and they may expect it to have agency (Mende et al., 2019). When their assumption is disproved, i.e. they realise that chatbot's behaviour is not autonomous, their expectations are violated and may be led to aversive behaviours (Burgoon et al., 2016).

The uncanny valley hypothesis further specified that animacy amplifies the effects of the uncanny valley (Mori, 1970). Several studies support this claim (Clayton & Leshner, 2015; Shin et al., 2019; Saygin et al., 2012) by proving that animated avatars are perceived as eerie and unpleasant, and the participants less accepted messages that were communicated by animated robots. Furthermore, Ciechanowski et al. (2019) reasoned that animacy might induce the uncanny valley effects when there is a mismatch between the avatar's appearance and motion. More specifically, while the appearance can be near-human, chatbot's facial movements do not mimic efficiently human facial expressions (Wang & Rochat, 2017). Nonetheless, there is a considerable number of studies that contradicts these findings. For example, Tung and Chang (2013) found, among other things, that the moving anthropomorphic robot did not intensify the feelings of eeriness but rather mitigated the effects of the uncanny valley by increasing the social attraction. The present research attempts to provide further insights into this academic debate by examining the extent to which the hyperrealistic appearance of an avatar in combination with animacy, added to chatbot, stimulate the feeling of eeriness.

Based on the uncanny valley effects hypothesis, the current study predicts that the interaction with hyperrealistic animated chatbots will induce a greater feeling of eeriness as compared to the interaction with cartoonish still chatbots:

H1: Interaction with hyperrealistic-animated chatbots will evoke a greater feeling of eeriness than interaction with cartoonish still chatbots.

### **The potential moderating role of familiarity**

The imperfect anthropomorphism of chatbot may make users feel uncomfortable because it seems unfamiliar and strange. In Mori's assumption, familiarity is the antipode of eeriness in the sense that participants perceived more familiar entities as less eerie. This can be explained by the assumption that familiarity conveys the impression of similarity (Moreland & Zajonc, 1982) and thereby covers the flaws in anthropomorphism. Garcia-Marques and Mackie (2000) assert that familiarity is generally a positive feeling intertwined with a positive mood. Since people frequently base their judgments on familiarity (Olson & Zann, 1993), they become less judgemental when encountering a familiar stimulus and are more receptive to it (Garcia-Marques and Mackie, 2001). Additionally, familiarity, that could emerge from the repeated exposure, may increase attraction and likeability, even when there is no prior social interaction (Bornstein, 1989; Moreland & Zajonc, 1982). Given the notion, adding a familiar avatar such as a celebrity's face to chatbots might potentially decrease the feeling of eeriness. Besides, previous research has indicated that familiarity with the robot goaded participants to evaluate them as warmer and thus mitigated the uncanny valley effects (Destephe et al., 2015). Based on these arguments, it is assumed that familiarity with avatars' face will moderate the uncanny valley effects.

H2: Familiarity of a chatbot will moderate the uncanny valley effects such that familiarity will weaken the relationship between the anthropomorphism of the chatbot and the feeling of eeriness.

### **The impact of eeriness on trust**

Since the development of e-commerce, plethora of studies has been conducted to understand the factors that constitute its growth. There is a general agreement that trust is a backbone for online vendors' success because it is related to multiple favourable outcomes such as consumer engagement with the brand and higher purchase intentions (Wang and Emurian, 2004). In addition, Mukherjee and Nath (2007) argue that trust is a prerequisite for forming relationships between companies and clients and is also an important determinant of the relation's quality. On the contrary, the paucity of trust triggers uncertainty and perceived risk (Fukuyama, 1995) and leads to reduced willingness for transactional activities (Luhmann, 1979).

Trust is fundamental for e-commerce due to its less controllable environment. More particularly, there is uncertainty whether the information received from the e-vendor is credible and truthful, especially when prior interaction does not exist. Alongside these arguments, Lu, Fan and Zhou (2016) propose that trust should not be seen outside the social context because it is gradually established through frequent social interaction (Pavlou, 2008). Thus, the lack of previous experience with the online sellers evokes scepticism in the consumers towards the quality of services and products because physical observation is not possible prior to the purchase (Kuosmanen, 2020). Trust towards the vendors can attenuate uncertainty and hesitation and lead consumers to proceed in purchases.

To gain a better understanding of the importance of trust, it is advisable to look at its definition. In general, trust is a multidimensional concept (McKnight & Chervany, 1996), and there is no agreement in a broad, widely accepted definition. Trust can be seen in multiple contexts: social, psychological, marketing and financial (Papadopoulou et al., 2001). Gefen (2000) defines trust as the people's confidence that the other party will not exploit them even

when they cannot control them. McKnight et al. (2002) distinguished two categories of trust, trust intentions and trust beliefs and conceptualised the latter as the perception of competence, integrity and benevolence towards the trustee. In the context of e-commerce, competence is the company's ability to offer what has promised to the client and its overall skills (Blokqvist, 1997). For example, the quality of the product must be equal to the description and the picture on the website. Integrity is associated with the way the exchanges between customers and the company are conducted, namely with honesty and reliability. Lastly, benevolence describes the retailer's behaviour. Notably, the retailers should be concerned about satisfying their clients and not prioritising their interests (Chen, 2003).

While trust is a fundamental principle for the growth and maintenance of e-commerce, multiple factors impede its establishment, such as societal norms and political or personal beliefs (Aljifri et al., 2003). The deployment of chatbots as salespersons in e-shops may also hinder trust. Notably, chatbots with sophisticated designs like hyper-realistic avatars may seem eerie to users due to the uncanny valley phenomenon. Uncanny valley effects can be considered an example of inhibition devaluation, triggered by the vacillation about whether the agent is human or not, and prompt negative evaluations such as decreased trustworthiness (Ferrey et al., 2015). Thus, eerie chatbots may be judged as untrustworthy. In line with this assumption, previous research found evidence that people have lower trust in robots that seem humane than those with a mechanical appearance (Mathur and Reichlig, 2016). Likewise, when people are exposed to chatbots with highly realistic avatars felt uncomfortable because of the incongruity between their high human-like appearance and lower human-like behaviour (Garau, 2003). In other studies the participants found the morphed chatbot less credible (Nowak et al., 2009) and less trustworthy (Shin, Song & Chock, 2019). A possible explanation for the formation of these judgements may

lie in the mood consistency hypothesis. More precisely, the uncanny valley effects rendered the negative emotions more prominent by activating aversive behaviours and hindered the ability of the participants to judge reasonably the information about chatbot's behaviour (Shin, Kim & Biocca, 2019). Taking into consideration these proposals, it is probable that eeriness will influence trust negatively.

H3: The feeling of eeriness, induced by the uncanny valley effects, will be negatively associated with trust.

### **Outcomes of trust in e-commerce**

As pointed out before, trust is a prerequisite for e-commerce success because it reduces the perceived risk. Indeed, the abundant information and number of products in e-shops complicate the customers and make them feel vulnerable. Together with the lack of personal interaction with the store representatives, these feelings rouse hesitation about the financial transaction to the clients (Lu et al., 2015). Trust in the vendor forms positive attitudes towards the online financial exchange and create intentions to buy the product by ruling out the uncertainty (Jarvenpaa, 2000). Customers' purchase intentions are an efficient predictor of purchase behaviours (Ajzen, 1991), and marketing managers widely use it to estimate company's profit for future planning (Morwitz et al., 2007).

More and more e-shops implement virtual assistants to induce trust by establishing relationships with customers (Kuligiwska & Lasek, 2011). Trust in virtual sales representatives relates to positive attitudes towards the agent (Gaudeillo et al., 2016) and the brand (O'Cass & Fenech, 2003). Moreover, trust implies that the client retains control and the agent will not attempt to take advantage of him. Given these circumstances, consumers are willing to revisit the website (Donney and Cannon, 1997) and reuse the chatbot. Willingness for future use of the

chatbot sales representative is a desideratum for marketing managers because it connotes customers' brand preference over other brands (Hellier, 2003) and helps them identify their target group (Pan & Zinkhan, 2006). Considering the significance of this information for marketing practitioners, this paper examines the relationship between trust and the two desirable outcomes. It is expected that trust would possibly influence the customers' purchase intention and their willingness to reuse the chatbot.

H4: Trust will positively impact consumers' a) purchase intentions and b) willingness to reuse the chatbot in the future.

As explained so far, the imperfect anthropomorphism of avatar's design may enhance the feelings of eeriness towards the chatbot and harm the perception of trust. Thus, it is expected that when trust is undermined, its concomitant benefits may be undermined in such a way that customers' willingness to spend money and use the chatbot in the future decrease. Indeed, the study of Nowak and her colleagues (2009) revealed that avatars that perceived eerie are seen as less competent, and the participants did not intend to cooperate with them in the future. Moreover, trust in the salespersons is a major predictor of willingness to buy the product. Based on this reasoning, we hypothesise that the uncanny valley effects on purchase intention and willingness to collaborate with the chatbot in the future will be mediated by consumers' trust.

H5: Trust in the chatbot will mediate the uncanny valley effects on a) purchase intention and b) willingness to reuse the chatbot in the future.

In summary, this paper attempts to confirm whether the feelings of eeriness evoked by hyperrealistic animated chatbots in e-commerce have a negative impact on trust. Furthermore, taking into consideration that the excessive level of human similarity due to the anthropomorphic

characteristics and the motion enhances aversive behaviours, it is expected that hyperrealistic animated avatars will induce higher levels of eeriness than cartoonish still avatars and will have a detrimental impact on trust. Consequently, the interaction with hyperrealistic avatars is expected to decrease purchase intentions and willingness to cooperate with the chatbot in the future.

Figure 1 presents the conceptual model of this research.

## **Method<sup>1</sup>**

### **Design**

To validate the hypotheses and answer the research questions, an online experiment was conducted. This study employed a 2 (Anthropomorphism: hyperrealistic-animated chatbot vs cartoonish-still chatbot)  $\times$  2 (Familiarity: celebrity vs unknown person) between-subjects design. The dependent variables of the study were respondents' purchase intentions and willingness to cooperate with the chatbot in the future, whereas the levels of eeriness and trust were sequential mediators posited between the independent variable and dependent variables.

### **Participants**

Almost half of the participants ( $N = 48$ ) were recruited via the SONA – i.e., a cloud-based participant management system provided by the Tilburg University, while 107 participants were invited to participate in the study with a link that was made available at my personal social media accounts. Participation in the experiment was voluntary and the participants that were recruited via SONA received academic credits after completing the study. In total, 187 participants took part in the experiment, but two of them failed to pass the attention check. Of the

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185 participants, 64% (N = 118) were females, while three did not reveal their gender. The mean age of the participants is 24.21 years old (SD = 6.22).

## Stimuli

The experimental material constituted a chatbot that would offer the participants the opportunity to ask for help to find a product (laptop) that they are interested in. The chatbot was developed with the online software Landbot.io. By clicking the provided link, participants are redirected to a new window where they can chat with the chatbot. The chatbot page consists of a text entry, the dialog screen and an avatar (Figure 6). More particularly, the chatbot for the present experiment is a disembodied agent with a hyperrealistic or cartoonish avatar. Overall, were created four types of avatars. The first set of avatars was created to measure the effects of anthropomorphism on eeriness and was consisted of one hyperrealistic-animated and one cartoonish- still avatar. Both of the two conditions depicted either a celebrity – i.e., Tom Cruise or a random person (see Figure 2). The latter manipulation was embedded to investigate the moderating role of familiarity with the face. The avatars were created with the facial animation software Crazy Talk 8<sup>2</sup>. The chatbot served the role of a sales delegate and provided information about a laptop. The selection of a laptop as a stimulus material was motivated because it is a neutral appliance, which is, in general, used almost evenly by both men and women (PewResearch, 2015) and fits any age (Alsop, 2021). In total, 27 laptops were implemented in the chatbot suggestions according to participant choices (Figure 5). Overall, there were four criteria according to which participants could search for a laptop, namely: budget, RAM, processor and brand and each of them provided three to four alternatives. After the interaction,

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<sup>2</sup> The avatars were developed by my supervisor (M. Shin) and were used for the development of the chatbot prototype, after acquiring permission.

the chatbot recommended a specific product by providing a link to inspect it. Although a specific scenario was given, the chatbot was capable of providing suitable links for every combination of choices in the case where participants did not comply with the instructions. By doing so, we tried to achieve a greater degree of realism. All the links implemented to chatbot were retrieved from Amazon.nl.

## **Procedure**

Participants were approached to participate in the experiments with University announcements through SONA system and by a general link that was posted publicly on the researcher's personal social media accounts. By selecting the proper study, they were redirected to the experiment, which was administered online to let the stimulus material look as realistic as possible. Participants were randomly assigned to one of the four conditions and were provided with an informed consent before proceeding to the experiment, according to the Netherlands Code of Conduct for Research Integrity. After they consented, they were asked to read the following scenario: "Put yourself into the situation under which you are looking for a new laptop. You would like to purchase a silver laptop and interest in the brand HP. Since you mostly use the laptop for office work, you will need a laptop with at least 8GB RAM and an Intel Core i5 processor. Finally, your budget is around 700€. After you received the product recommendation, please return to this page and fill in the survey. Click on the hyperlink below to be directed to the experiment." Given the fact that it was impossible to control the participants directly, we edited the Qualtrics questionnaire accordingly by allowing them to proceed to the next step only after chatting with the chatbot at least for 45 seconds. After finishing their conversation, participants were asked to complete a survey created with Qualtrics. Respondents answered a series of questions regarding their experience with the chatbot. Lastly, they asked to

provide some demographic information and were thanked for their participation. Participants that were recruited via SONA received additionally 0.5 credits.

## **Measures**

### ***Eeriness***

In order to measure the extent to which the appearance of a chatbot evoked the feeling of eeriness, three 7-point semantic differential scale items were extracted from the study of Ho and MacDorman (2010). An example question is “Reassuring/ Eerie”. The scale had a satisfying level of internal consistency reliability ( $\alpha = .77$ ).

### ***Trust***

To measure the extent to which participants perceived trust in the chatbot, four 7-point Likert scale items such as “I find chatbot benevolent, competent etc.” (1= completely disagree; 7 = completely agree) were used. The measure was extracted from the study of AI-Natour et al. (2011). The internal consistency reliability of the measure was acceptable ( $\alpha = .78$ ).

### ***Purchase intentions***

The construct of purchase intentions was measured by using the five questions extracted from the study of Spears and Singh (2004). This measure consists of five 7-point Likert scale items such as “I will probably purchase the recommended laptop in the future”, “I have high purchase interest of the recommended laptop in the future”. (1= completely disagree; 7 = completely agree). Reliability analysis confirmed that the measure is highly reliable ( $\alpha = .95$ ).

### **Willingness to cooperate with chatbot in the future**

A single item questionnaire was used to measure participants' willingness to reuse the chatbot: "I would be willing to use the virtual assistant again". Respondents had to choose an answer from the 7-point scale (1 = completely disagree; 7 = completely agree).

### **Data Analysis**

To assess the relationships between the variables, the partial least squares structural equation modeling (PLS-SEM) was conducted. The reason for selecting PLS-SEM was because this technique is known to generate valid results in an experimental study with a small sample size and enables the evaluation of complex research models. In addition, the indirect effects of the path were analysed using the PROCESS macro in IBM SPSS 21 software (Hays, 2020).

## **Results**

### **Measurement validity**

Prior to testing hypotheses, the validity of the measurement model was examined using the software PLS-SEM 7.0. According to Kock (2020), the item loadings of the reflective indicators must exceed .5 with statistical significance ( $p < .05$ ) to ensure the validity of a measurement model. According to the results of PLS-SEM analysis, the validity of all measures was confirmed because the value of every item loading exceeded .7 and had  $p$ -values lower than .001 (see Table 1), indicating sufficient reliability of reflective indicators in the measurement model. In addition, as presented in the measures section, the internal consistency reliability of all the measures was acceptable as they were above .70.

### **Hypotheses testing**

The first hypothesis predicted that people who interact with the hyperrealistic-animated avatar would experience greater feelings of eeriness than those who interact with cartoonish-still avatar. In line with H1, the results of PLS-SEM confirmed the significance of the direct causal relationship between the avatar's human-likeness and the experience of feelings eeriness. More specifically, participants who interacted with the hyperrealistic-animated avatars ( $M = 4.65$ ,  $SD = 1.35$ ) reported significantly greater feelings of eeriness than those who interacted with the cartoonish-still avatar ( $M = 3.71$ ,  $SD = 1.10$ ),  $\beta = .35$ ,  $p < .01$ . An additional observation, is that the direct effects were cancelled when the moderator familiarity was present (Figure 3).

The second hypothesis proposed that participants familiarity with the avatar, i.e. avatar representing a prominent person, would moderate the uncanny valley effects, such that familiarity will weaken the relationship between the anthropomorphism of the chatbot and the feeling of eeriness. Indeed, a moderation analysis revealed that the familiarity with the avatar significantly moderated the relationship between avatars' human-likeness and feelings of eeriness ( $\beta = .35$ ,  $p < .01$ ). Results showed that whereas familiarity weakened the feelings of eeriness for the participants who interacted with the hyperrealistic-animated avatar, the opposite results were observed for the participants who interacted with the cartoonish-still avatar (Figure 3). For the specification of the moderation effects pattern, an independent samples t-test was conducted. Results from an independent samples t-test indicated that the participants who interacted with the familiar cartoonish avatar ( $M = 3.96$ ,  $SD = 1.06$ ) reported significantly higher feelings of eeriness as compared to the participants who interacted with the unfamiliar cartoonish avatar ( $M = 3.41$ ,  $SD = 1.08$ ),  $t(81) = -2.38$ ,  $p = .02$ . Human-likeness, together with the moderator familiarity, explained 18% of the variance in the feeling of eeriness ( $R^2 = .18$ ) (Figure 4). Results were in partial support of H2.

H3 posited that the feelings of eeriness, induced by the uncanny valley effect would negatively affect trust. PLS-SEM analysis results were consistent with this hypothesis. Participants that experienced greater feelings of eeriness showed lower trust in the avatar ( $\beta = .38, p < .01, R^2 = .14$ ). In addition, H4 postulated that trust would positively affect consumers' a) purchase intentions and b) willingness to collaborate with the chatbot in the future. In support of H4, results of PLS-SEM analysis showed that participants who reported higher trust on the avatar exhibited significantly higher a) intention to purchase the recommended product ( $\beta = .39, p < .01, R^2 = .15$ ) and b) willingness to collaborate with the chatbot in the future ( $\beta = .61, p < .01, R^2 = .37$ ). Thus, H3 and H4 were supported.

Last, H5 predicted that trust would mediate the relationship between the uncanny valley effects (i.e., a feeling of eeriness) produced by avatars' human-likeness on a) purchase intentions and b) willingness to cooperate with the chatbot in the future. To test the mediating effects of trust on the two constructs, a bootstrapping method was performed by using the PROCESS macro in SPSS (Hays, 2020). The results showed that trust significantly mediated the relationship between uncanny valley effects on purchase intentions,  $B = -.86, SE = .37, 95\% CI[-.21, -.07]$ . Thus, the indirect effect was statistically significant. Similarly, trust was found to significantly mediate the uncanny valley effects on participants' willingness to collaborate with the chatbot in the future ( $B = -.25, SE = .05, 95\% CI[-.35, -.16]$ ) (see Table 3). Hence, H5 is supported.

### **Model fit**

To test whether the research model of this study has a good fit, average path coefficient (APC), average R-squared (ARS), average variance inflation factor (AVIF) and average full collinearity VIF (AFVIF) were estimated by WarpPLS 7.0 (Kock, 2020). Kock (2020)

demonstrates that a good model fit can be ensured by the statistical significance of APC and ARS statistics ( $p < .05$ ). In addition, AVIF and AFVIF values equal to lower than 5, and ideally equal to lower than 3.3, ensures that a model has a good fit. All in all, results showed that the research model of the current research has a good fit:  $APC = .36, p < .001$ ;  $ARS = .21, p < .001$ ;  $AVIF = 2.19$ ; and  $AFVIF = 1.46$ .

## **Discussion**

The deployment of hyperrealistic chatbots by online marketers has been proven to trigger favourable outcomes such as increased purchase intentions (Han, 2020; Yuan & Dennis, 2019), willingness to reuse it and accept its recommendations (Sheehan, 2018; Adam et al., 2020) as well as positive evaluations towards the brand (Araujo, 2018). Another line of literature supports that anthropomorphism is responsible for causing uncanny valley effects like discomfort and feelings of eeriness (Mori, 1970). In this paper, chatbot anthropomorphism occurs by implementing visual cues to the chatbot, i.e. a hyperrealistic avatar. The present study investigated how the implementation of an avatar in a chatbot at e-commerce affects customers' purchase intentions and willingness to reuse the chatbot (Keeling et al., 2010). Notably, this study examined whether the chatbot with the hyperrealistic avatar evoked feelings of eeriness due to the activation of the uncanny valley effects, while exploring the potential moderating effects of avatar familiarity. In addition, the relationship between the feeling of eeriness, trust, purchase intentions, and willingness to reuse the chatbot in the future was explored. Overall, the study provides evidence that uncanny valley effects, engendered by the avatar's hyperrealistic design, had a negative impact on customers' purchase intentions and their willingness to reuse the anthropomorphic chatbot.

Particularly, the results of the experiment revealed that the humanisation of the avatar is closely related to the uncanny valley effects. More precisely, interaction with the hyperrealistic-animated avatar evoked greater feelings of eeriness to the participants than the interaction with the cartoonish-still avatar. These results are consistent with previous research findings (Wang & Rochat, 2017; Shin, 2019a; Shin, 2019b), which confirm Mori's theory (1970). However, it seems that the uncanny valley effects can be weakened when familiarity comes into play.

The outcomes of the analyses supported the second hypothesis "Familiarity of a chatbot will moderate the uncanny valley effects such that familiarity will weaken the relationship between the anthropomorphism of the chatbot and the feeling of eeriness.", and showed that familiarity weakens the relationship between avatar's human-likeness and the uncanny valley effects. Participants exposed to the hyperrealistic-animated avatar that represented Tom Cruise experienced lower levels of eeriness than those exposed to the avatar of a random person. However, the results were unanticipated for the participants who interacted with the cartoonish-still avatar. In that case, those who were exposed to the familiar avatar reported a higher level of eeriness (see Figure 3). These reverse results influenced the direct effect of avatar's human-likeness on eeriness by cancelling its statistical significance. To our knowledge, no other experiment in the field produced similar results. A possible explanation of this outcome might be that the unfamiliar cartoonish avatar seems to smile slightly while the familiar cartoonish avatar is inexpressive (see figure 2). A significant volume of literature argues that smiling rouses favourable evaluations during interpersonal communication and creates the perception of friendliness and openness (Izard, 1971; Deutsch et al., 1987). In the same vein, Krumhubel et al. (2007) demonstrate that smile increased likability and attraction. Hence, the perception of a smiling avatar possibly reduced the uncanny valley effects due to the increased likeability.

Nevertheless, it is noteworthy that the smile of the unfamiliar cartoonish avatar was mistakenly added while copying the unknown's person original image. More details are discussed in the limitations of the study.

A further possible explanation relates to the proposition of the expectancy violation theory. This theory demonstrates that people tend to form certain expectations towards partner interactants, and these expectations are based on the characteristics of the interactants (Burgoon et al., 2016). Given the notion, we might carefully speculate that the participants exposed to the cartoonish still chatbot with Tom Cruise's caricature could have expected a more accurate representation of Tom Cruise as they already had some prior knowledge about the real appearance of Tom Cruise. In other words, participants' expectancy over the detailed portrayal of Tom Cruise might have been possibly violated in the cartoonish condition, and this might have led participants in the familiar cartoonish condition to form negative impressions towards the chatbot (e.g., reduced likeability and aversiveness; Burgoon, 1993). Worthy of note, likeability and aversiveness are the concepts that commonly denote the affective outcomes of the uncanny valley effects, and such perceptions of reduced likeability and aversiveness, caused by the expectancy violation, might have contributed to unexpectedly inducing a greater feeling of eeriness in the familiar cartoonish condition.

An additional finding of the study is that eeriness significantly affected trust in the chatbot. The results suggest that when the level of eeriness was higher, people tended to show lower trust in chatbots. These findings are in line with previous research, which demonstrates that feelings of eeriness can activate inhibition and aversive behaviours (Ferrey et al., 2015), resulting from less trustworthy and unbelievable evaluations of an avatar (Shin et al., 2019; Weisman & Peña, 2021). Moreover, results from a mediation analysis showed that the feeling of

eeriness extended to the negative evaluation of trust in a chatbot. In other words, the interaction with the hyperrealistic-animated avatar induced a great feeling of eeriness and subsequently decreased trust in the chatbot. The present finding could be explained by the cognitive conflict to categorise the avatar either in humans or non-humans. To be more explicit, people might have doubted whether they have interacted with a human or a non-human entity and perceived it as strange (Yamada et al., 2012). Consequently, they might have become cognitively inhibited and found chatbots hard to trust. Likewise, a decreased trust may have occurred from avatar's inauthentic behaviour (Garau, 2003). Notably, whereas avatar's appearance resembled human, its facial expressions were irrelevant to respondents' answers, reminding them that they communicate with a machine. More explicitly, the hyperrealistic avatar smiled and nodded recurrently regardless of participants' responses, whereas the participants may have expected that it would react according to their input. Thus, the lack of originality in avatar's behaviour, elicited by its inaccurate feedback, may have influenced people's judgments about its trustworthiness.

Furthermore, trust was found to be significantly related to participants intentions to buy the recommended product and their willingness to use the chatbot in the future, as expected. This finding complements multiple studies which investigate the factors that lead customers to make purchase decisions and revisit the webstore (Yen, Chang and Chiang, 2014; Akman and Mishra, 2017, Hassan et al., 2018). In an online context, where there is no guarantee for the quality of the offered product, trust becomes a fundamental factor that customers rely on for purchasing.

Lastly, the experiment indicates that trust mediates the uncanny valley effects on participants' purchase intentions and their willingness to reuse the chatbot in the future. That is a novel finding that investigates the relationship among the four variables thoroughly, whereas

previous studies examined the relationship between eeriness and trust, and the association of trust with the purchase intentions and willingness to reuse the chatbot separately.

### **Theoretical contributions**

The present study contributes to the academic literature in two ways. Firstly, it provides supporting evidence for the uncanny valley theory, introduced by Mori (1970), by proving that implementing a hyperrealistic avatar in a chatbot in the context of e-commerce increases the feelings of eeriness. Particularly, the hyperrealistic-animated avatar prompts greater eeriness than the cartoonish-still avatar. Uncanny valley effects have troubled scientists and practitioners who occupy with human-machine interaction because they contradict the evidence that human-likeness influences positively users' attitudes (Følstad & Skjuve, 2019; Araujo, 2018). The paper confirms the adverse outcomes of uncanny valley effects on users' attitudes and reveals that avatar's humanisation undermines trust towards the chatbot through eeriness. Thus, it complements previous research that investigated the impacts of eeriness on avatars' and robots' trustworthiness (Shin et al., 2019; Torre et al., 2019; Weismann & Peña, 2021).

Secondly, the study unveiled the favorable influence of avatar's familiarity on uncanny valley effects. Study results support that participants exposed to an avatar of a familiar face, namely Tom Cruise, evaluated the hyperrealistic avatar as less eerie compared to those who interacted with an avatar of a random person. To our knowledge, no other study thus far investigated the effects of a familiar avatar deployment, especially the role of deploying a celebrity avatar, on eeriness in the context of e-commerce. Previously, although Mastuda et al. (2012) attempted to answer whether infants experienced uncanny valley effects by looking at morphed avatars that either depicted their mothers or strangers, no significant effects were found. The novel results of the present paper contribute to the current literature of uncanny valley

effects by providing more insights into the possible factors that may enhance or attenuate the uncanny valley effects.

### **Practical implications**

This study has valuable practical implications for chatbot designers and online marketers who intend to implement a chatbot as sales assistant in an e-shop or improve the human-computer experience. Considering the outcomes of the experiment, a first recommendation for chatbot designers would be to eschew creating excessively hyperrealistic avatars unless they achieve a perfect human resemblance. People prefer to interact either with a less humanised avatar, like a cartoonish one, or with an actual human, otherwise, the realism ambiguity induces discomfort and lead to unfavourable evaluations of a chatbot. Consequently, users may not use the chatbot again or revisit the site if they believe that they will not get the desired help. Similarly, the results indicated that eeriness, generated by avatar's appearance, is associated indirectly with purchase intentions, in the sense that it may harm buying decision through diminished trust. For that reason, it would be advisable to design chatbots in a way that inspire trust in consumers by using natural visual cues and enhancing their expertise (Chircu et al., 2000).

### **Limitations and future directions**

This study has revealed several interesting results about the use of avatars in e-commerce chatbots but is subject to certain limitations. Firstly, the attention check was not conducted properly. The participants in the familiar avatar condition were mistakenly excluded from the attention check question and we cannot verify whether they observed the avatar carefully. However, to attenuate this problem, more participants were recruited for this condition. Future

studies should ensure that there is complete consistency between the conditions of the two groups. Secondly, due to the public health restrictions introduced by World Health Organisation the experiment was performed online. Therefore, it was not possible to control the participants, but the control was limited to integrating a timer into the survey, which enabled participants to proceed to the questionnaire only if they spent at least 45 seconds communicating with the chatbot. A laboratory experiment should be considered in the future. Thirdly, contrary to the familiar cartoonish avatar, which is serious and inexpressive, it was observed that the unfamiliar cartoonish avatar appears to smile slightly. The smile was not added intentionally, but it was mistakenly included during the process of copying the person's expressions from the original photography that was used to create the avatar. Future research should examine avatars' facial features in more detail to avoid inconsistencies between the two conditions and ensure the responses' validity. Ideally, they should ask the volunteer to be photographed while making various expressions that match the other condition.

An additional limitation of the study is that while the scenario described that the participants are interested in buying a laptop, in reality, they probably did not have such intention, so the answers they gave may be biased and inaccurate. Besides, buying a laptop requires a moderate to high budget. Thus, potential buyers contemplate their purchase decision. Nonetheless, during the experiment, participants did not have much time to think meticulously, so they may not have reported their purchase intentions realistically. It would be advisable for future studies to conduct the experiment with multiple products of different value and use. For example, it should be tested whether expensive utilitarian products like a dining table will elicit different results from hedonic, less expensive products such as books.

Moreover, future research should examine additional factors that may have affected study's results, such as participants' demographic characteristics, i.e. gender and age, and avatar's external characteristics, namely gender and race. Similarly, complementary studies might explore whether chatbot's communication style and tone of voice impact respondents' answers. Furthermore, it would be suggested to assess participants' attitudes towards the celebrity represented by the avatar prior to the experiment. Eventually, a combination of quantitative and qualitative could be conducted to obtain more insights about participants' thoughts of the avatar and chatbot.

### **Conclusion**

E-commerce has become a common means for purchasing products and online vendors seek solutions to offer a better customer service experience for their clients. With the help of AI, online marketers could replace the role of the traditional sales assistant with the deployment of chatbots. Overall, the present study extends the existing literature by providing additional evidence about the uncanny valley theory and provides novel findings regarding the use of celebrities' avatars in the context of e-commerce. Finally, it accentuates the significance of trust in e-commerce and points out the negative impact of eeriness on trust.

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## Appendices

### Appendix A: Tables

**Table 1**

*Item loadings for reflective indicators*

| E  | IL     | T  | IL     | PI  | IL     | WFU  | IL      |
|----|--------|----|--------|-----|--------|------|---------|
| E1 | .80*** | T1 | .82*** | PI1 | .79*** | WFU1 | 1.00*** |
| E2 | .78*** | T2 | .81*** | PI2 | .79*** |      |         |
| E3 | .84*** | T3 | .73*** | PI3 | .79*** |      |         |
|    |        | T4 | .74*** | PI4 | .80*** |      |         |
|    |        |    |        | PI5 | .81*** |      |         |

*Note.* E = Eeriness, T=Trust, PI = Purchase Intention, WFU = Willingness to Reuse the Chatbot in the Future, IL = Item Loading.

\*\*\* $p < .001$

**Table 2**

*Mediation effects*

| Mediation Path                                                   | B <sup>a</sup> | SE  | Indirect Effect 95% Confidence Intervals |       |
|------------------------------------------------------------------|----------------|-----|------------------------------------------|-------|
|                                                                  |                |     | LL                                       | UL    |
|                                                                  |                |     |                                          |       |
| Eeriness→Trust→Purchase intention                                | -0.86          | .37 | -0.21                                    | -0.07 |
| Eeriness→Trust→Willingness to collaborate with chatbot in future | -0.25          | .05 | -0.35                                    | -0.16 |

<sup>a</sup> Unstandardised path coefficient.

**Table 3**

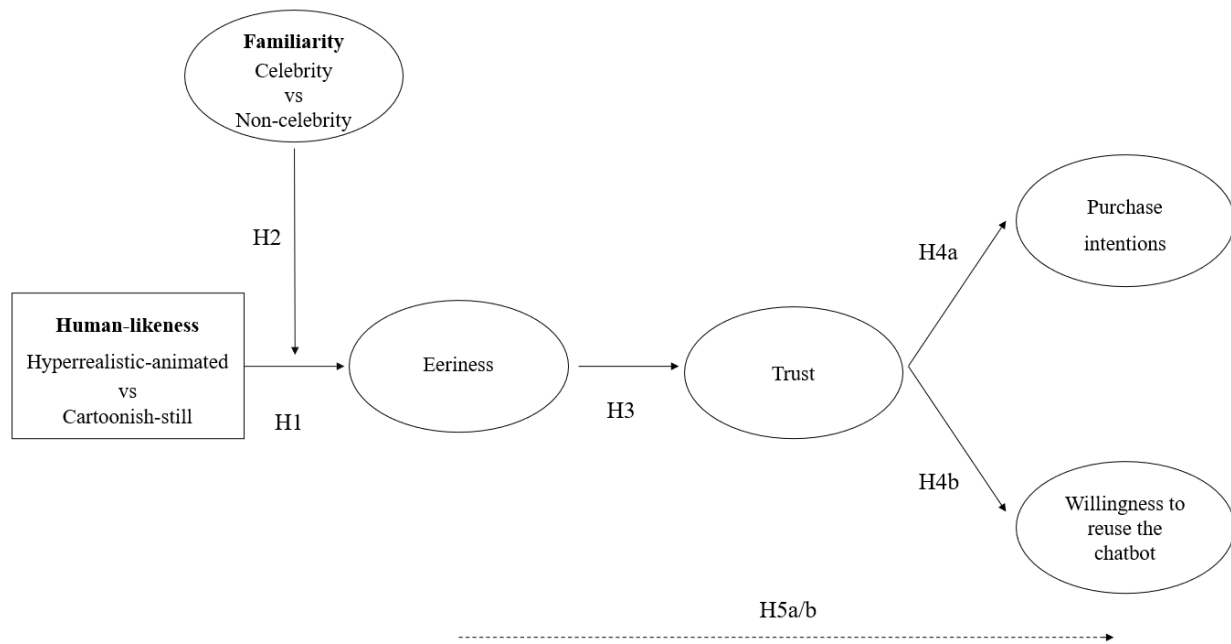
*English proficiency of participants*

| Proficiency Level           | Percentage |
|-----------------------------|------------|
| Elementary proficiency      | 3.8        |
| Limited working proficiency | 14.6       |
| Professional proficiency    | 58.9       |
| Native/bilingual            | 22.7       |

## **Appendix B: Figures**

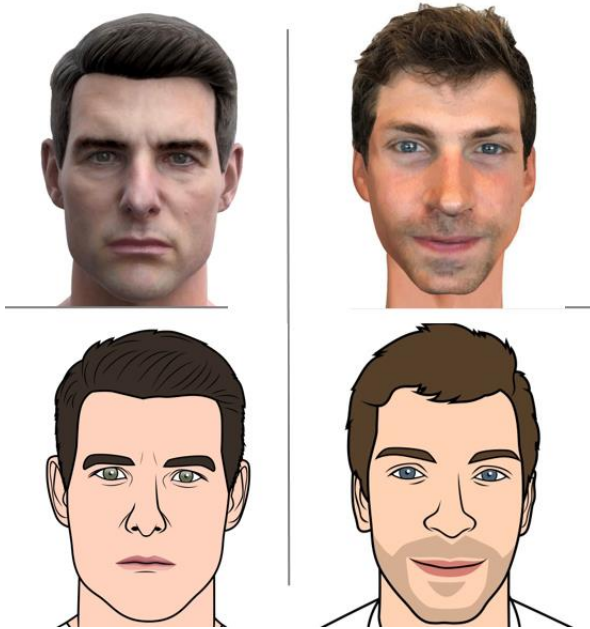
### **Figure 1**

*Research model*



**Figure 2**

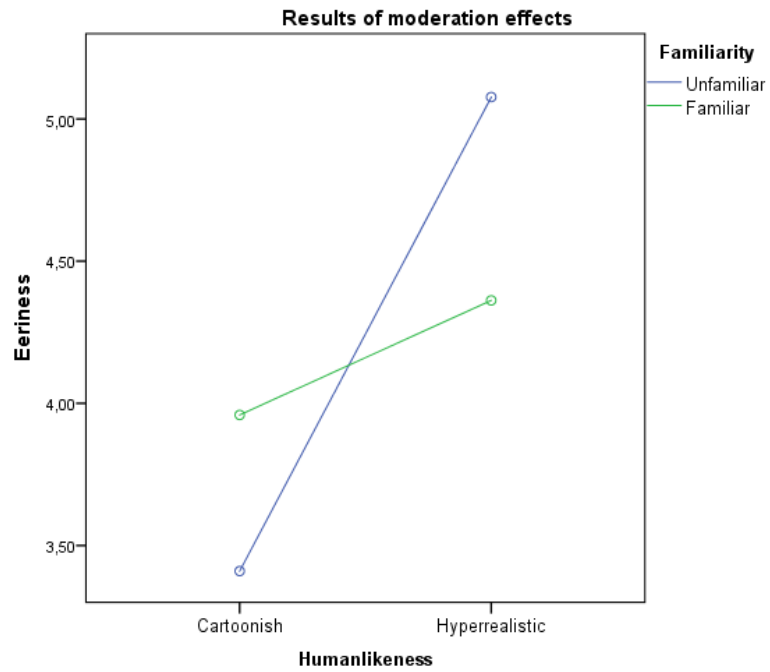
*Illustration of avatars*



*Note.* Final stimuli used for the experiment. Sample of hyperrealistic-animated avatars and cartoonish-still avatars

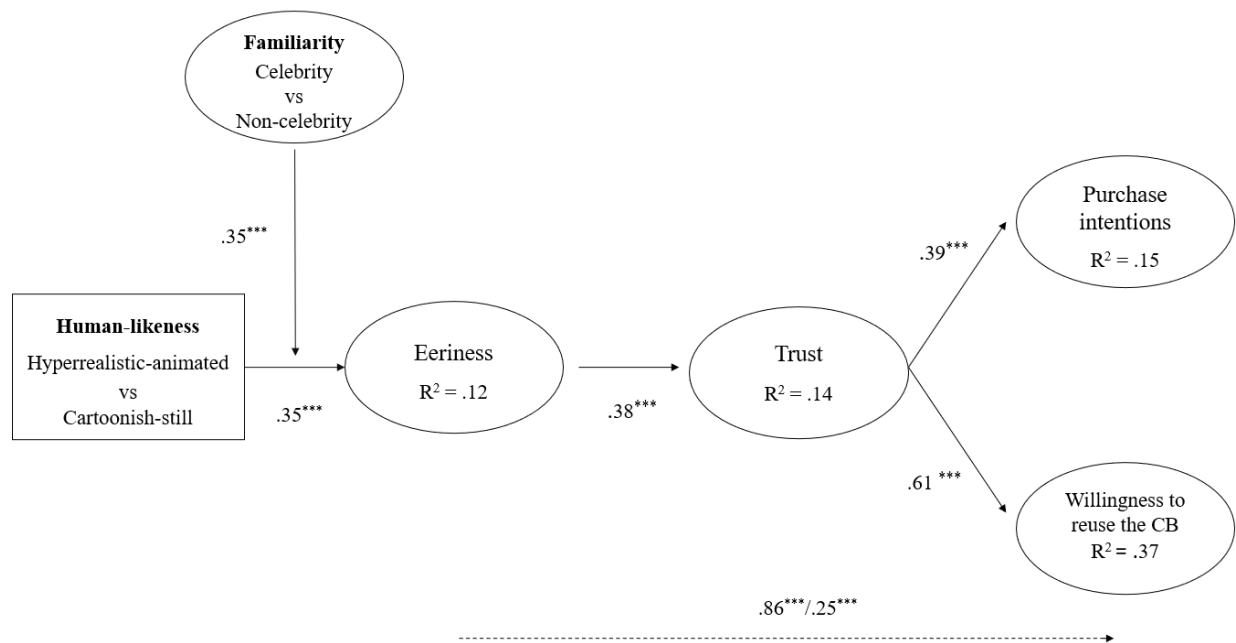
### **Figure 3**

*Results of moderation effect*



**Figure 4**

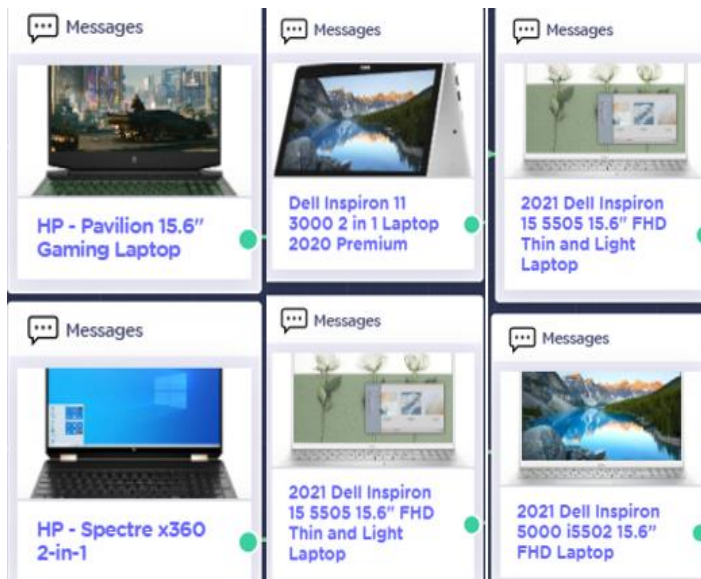
*PLS-SEM results*

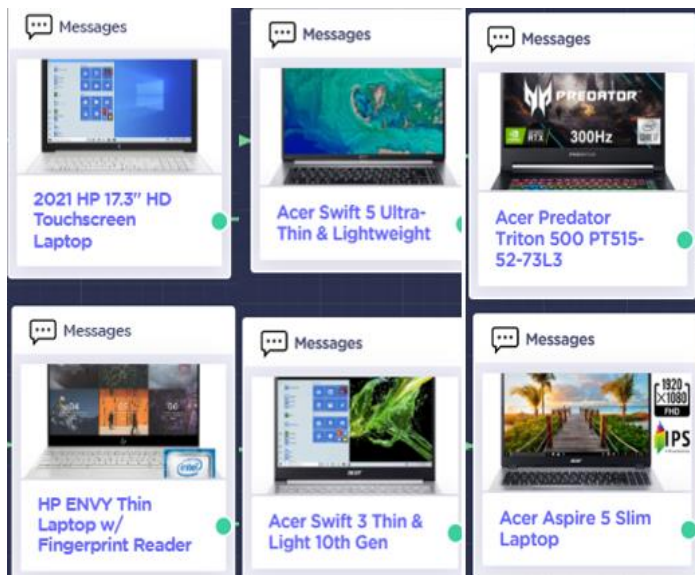


Note. CB = Chatbot.  $***p < .001$

**Figure 5**

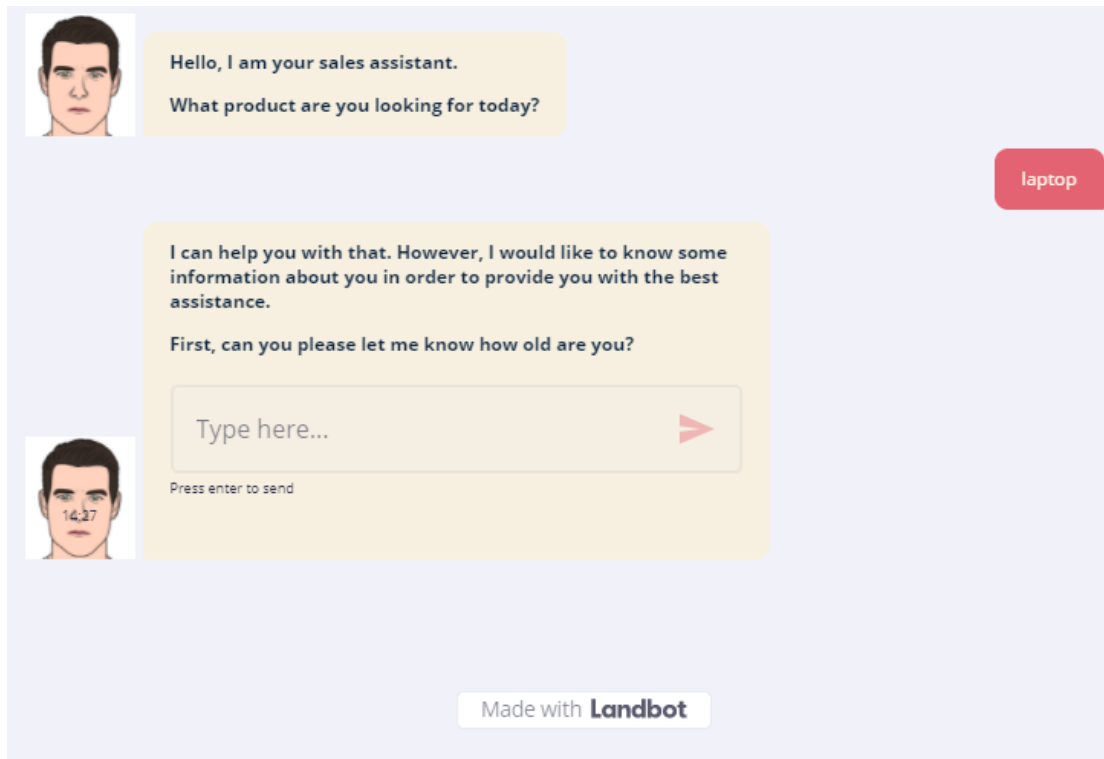
*Examples of laptops stimuli*





**Figure 6**

*Example of chatbot conversation*



**Figure 7**

*Chatbot prototype*

