Transforming Service Experience Through Anthropomorphic Robots

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Table of Contents

Chapter 3
Trust Me, I'm a Robot:
AI-Powered Personalisation, Consumer Trust, and Purchase Intention in Anthropomorphic Retail Service

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ABSTRACT

Retailing enters a new era where the AI personaliser goes beyond digital technology to be an anthropomorphic robot that can identify the customer, recall their history of purchases, and adapt itself based on the type of interaction. Using CASA theory, the personalization versus privacy paradox, and uncanny valley theory, the chapter formulates a conceptual framework where anthropomorphic design intensity acts as a moderator to intensify the role of trust building through AI personalization and privacy concerns on purchase intentions. The extensions are based on an empirically tested model (N = 214) where bootstrapped mediation revealed that trust has

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a positive mediating role in the relationship between personalization and purchase intentions, whereas privacy concern had a negative indirect effect on it. Strategic implications are made for the use of anthropomorphic service robots as brand ambassadors with a considerable potential to influence consumer trust.

1. INTRODUCTION

Our retail service landscape is changing more than ever. The reconfiguration of humans and machines is not the only sign of this transformation, but also the ways the consumers come in contact with the brands, the advice they get and the personal attention they receive in commercial spaces. From luxury fashion and consumer electronics to food retail, humanoid service robots have transitioned from demonstrations to the front lines. Pepper, the softbank robotics' POCD, has been presented to shoppers at Carrefour hypermarkets and in NatWest bank branches. Simbe Robotics has trialled autonomous shelf scanning robots in Walmart superstore. In the East Asian markets, the facial recognition and natural language dialogue and emotional response technologies utilised by robotic service agents are a reality of high-end retail settings. These systems are transactional based and their value is not just technological, they represent a blend of a social interaction, a service worker and a data-driven decision medium. These are powered by AI software and can identify even repeat customers, recall purchase and preference trends, provide real-time product suggestions and modify their communication style according to the detected emotional state of the consumer. It's a personalisation of the retail experience that's closer, more personal to actual users than traditional ecommerce personalisation, since the recommendation is reaching the end-user through voice, gaze, gesture and interpersonal proximity, rather than a simple Web page or an app notification. This shift from demonstration to deployment also alters the research question: when robots move into normal retail environments, consumers do not need to imagine themselves in a futuristic world, but think about how they will respond when confronted with a physical robot which is a real service agent and might impact their actual buying behavior.

This seems analytically quite significant because it combines two phenomena studied separately in both the marketing and human–robot interaction (HRI) literatures: technology and the perceived quality of the service. This is analytical challenge because of the known benefit/risk of personalisation is changed by the introduction of a body, a face and a set of human-like behavioural cues in the personalising system. This is the first: AI-driven personalisation as the ability of intelligent systems to shape commercial content, recommendations and experience for individual consumers, according to models of consumer preference, derived from these data. In

retail practice, this ability extends from a more simple capability of matching with the recommended system up to more advanced real-time adaptations in a process of behavioural traces, inferences from loyalty data and demographies, purchase histories or interactions leaving evidences on the encounters. In digital environments personalisation has been well researched, and while it has been proven to lead to better relevance and conversion, has also been found to spur privacy concerns that may reduce trust and negate purchase intentions (Awad & Krishnan, 2006; Bleier & Eisenbeiss, 2015; Dinev & Hart, 2006). The second is anthropomorphism with respect to service robotics, which embodies the design principle whereby a robot is given anthropomorphic features such as facial expressions, gestural fluency, natural language prosody and apparent emotional responsiveness to help ease social interaction between the robot and the consumer (Bartneck et al, 2009; Epley et al, 2007; van Doorn et al, 2017). The advantages of these attributes are their commercial utility: if robotic service is perceived as more accessible, consumer byproducts of robotics are more beneficial. It is also an important psychological factor; consumers make overt evaluations of salt robots from their sets of social attributes such as helpfulness, sincerity, politeness, competence and discretion.

Implementing these two phenomena in physical retail is not sufficiently systematically explored. Existing research has studied technological acceptance of robotic services and the efficacy of a digitally personalized service encounter, but not much related to the two issues together in a physically embodied, socially expressive, data-rich service encounter. So far, research in the field of HRI has mainly been about technical functionality and behavioural acceptability, with personalisation being considered as a part of the procedural capabilities of the system rather than as a psychologically loaded process that gives rise to a sense of trust, privacy calculation and brand assessment. The marketing literature has, on the other hand, focused solely digital applications of AI personalisation in the context of ecommerce websites, recommendation agents and chatbots, neglecting to consider the qualitatively distinct psychological dynamics that occur when the personalising agent has a body, a face and a proven ability to engage in social and emotional reciprocity. This is relevant because the recommendation appearing suitable on a website may be read differently by consumers when it is spoken by a robot who is aware of the consumer, who is standing near the consumer, and feels like it's speaking to the consumer, rather than the common profiles associated with a particular website.

This chapter aims to fill in that gap. It does so by highlighting the embodied personalisation as a different theoretical problem, not an an easy extension of an online recommendation system. It created a conceptual framework that brings together the design of anthropomorphic-looking robots, the incorporation of artificial intelligence for personalisation, consumer trust, concerns over privacy and purchase intention within a retail service context. The framework has been based on an em-

pirical validation of the authors' original structural model (N = 214), which tested the framework in an online retail setting. This empirical baseline is used with care: the chapter suggests that online and robot-mediated retail transactions are not the exact same, but the established relationships can be extended and elaborated upon by theorising how embodiment, anthropomorphism, and social presence can modulate and shape the consumer's responses. This model suggests that personalisation positively predicts trust and purchase intention, and that personalisation–purchase intention relationship was partially mediated by trust while purchase intention was negatively predicted by privacy concern. The chapter validated this baseline and applies this in a physical anthropomorphic robot context, adding anthropomorphic design intensity as a theoretically motivated moderating variable, and using the theory from CASA, the uncanny valley hypothesis, and social presence theory to provide explanations for the effect of embodied personalisation for each of the three structural pathways. The contribution is both empirical and conceptual, empirical from an experiment-based trust mediated model, conceptual from the development of an extended model specifically applicable to the robot.

The chapter is structured and organized as follows: The organisations follows a logic that goes from theory to empirical evidence and finally to the extension of robot-context, rather than a speculative one. The relevant literatures relevant to service robots, AI personalisation, consumer trust and privacy concern are reviewed in section 2. The conceptual model and formal hypotheses are given in Section 3. An empirical methodology is described in Section 4. The quantitative results are presented in section 5. Section 6 extends the theoretical development from the context of anthropomorphic robot. Ethical issues are explored in Section 7. Section 8 provides a managerial insight and some strategic recommendations. Finally, Section 9 presents a research agenda for future. In these sections the main theme that the chapter focuses on is that the very same aspects that enable personalisation of AI systems make the use of data personal feel intrusive and manipulative.

2. LITERATURE REVIEW

2.1 Anthropomorphic Service Robots in Retail

Service robots are increasingly being perceived less as machines to automate tasks and more as societal actors working in service settings, roles that traditionally were taken by human workers (Wirtz et al., 2018). The conceptualisation is significant because it transcends indicators of efficiency and cost reduction to seek to understand what customers perceive robotic behaviour means in a service relationship, especially if the robot is a visible, interactive representation of the retailer. Van Doorn et al.

(2017) coined the term of automated social presence, which refers to the process of how the AI embodied or virtual service agents establish a sense of social presence that impacts customer experience and service evaluation. The instantiation of this phenomenon that is particularly interesting, and dynamic, is anthropomorphic service robots: they activate social cognitive processes which would not be set off by a conventional automated system (Nass & Moon, 2000). Processes like making intentions, showing politeness, respect, even moral responsibility, in reference to the agent are being used despite his or her concurrent realization that the robot is still a programmed system. In the retail industry, the concept of automated social presence has gained immense significance as customers tend to form an opinion of the service based on minor nonverbal cues such as expressed acknowledgment, promptness and helpfulness, which are all potentially replicable and adjustable with a robot's design.

An anthropomorphic design literature reveals that certain aspects of anthropomorphism are important for the response of consumers to a service robot. Anthropomorphism is, therefore, not a simple design decision, but a set of cues that can work on different levels, which might be warm voice in the cutie mark that makes people feel socially at ease, highly realistic face in the cutie mark that makes them feel uncomfortable, and smoother gestural timing that make them feel competent on that mark. Bartneck et al. (2009) created the Godspeed questionnaire series to assess anthropomorphism, animacy, likeability, perceived intelligence, and perceived safety as separate, but inter-related, facets of the human response to robots. According to studies (Qiu & Benbasat, 2009; Tung & Au, 2018; Yoganathan et al., 2021), there is evidence linking each of the three factors facial expressiveness, voice naturalness and gestural fluency to perceived warmth and social competence which are key factors in service satisfaction and behavioural intentions. That does not necessarily translate to a positive response by consumers, though. This nonlinearity forms the core of this chapter as it suggests that retailers can not blindly adopt the belief that the more human-like, the more accepted and/or trusted and the more likely the purchase behaviour will be. The uncanny valley hypothesis was popularly proposed by Mori (1970): There were times when Robots which were very similar to humans would generate a greater sense of affinity, but then, at some point in the range of near-human realisation, the response would suddenly turn to aversion or unease. Ho and MacDorman (2010) showed and quantified this trend, reaching the conclusion that the uncanny valley effect was strongest for hybrid forms a human face and non-human movement. In terms of retail robot design, this has relevance: the key is to avoid reaching the uncanny zone, so anthropomorphic features need to be tuned not to veer off-road into the uncanny valley. Also, there is sensitivity to service context since the degree of "humanlikeness" that works in a simple way-finding case might not be suitable in cases where individuals are

buying at high values, having personal information that is relevant to a purchase, or emotionally sensitive. The significance of these design elements is because service in retail is typically quick and emotional: customers could judge on helpfulness or discomfort before it even hits their consciousness whether the robot recommended a technically good service.

Some consistent findings in the literature from a sector perspective are documented with regard to the retail and hospitality sector and service robots. The facts revealed that there is more than a technologic performance aspect to which users assess robots; they also assess the appropriateness, respect, usefulness of the robot's behaviour and its consistency with the expectations of the service situation. When involving robots in service functions, the information delivery and wayfinding kind of tasks are the most effective tasks to be performed, whereas customers' satisfaction levels have complex connections with perceived warmth and emotional responsiveness in complex service encounters, relative to the technical competence aspects (Xiao & Kumar, 2021; Choi et al., 2021). De Keyser et al. (2019) postulated a typology of service technology infusion, with service augmentation services and service substitution services, suggesting that the reaction of the consumers depends on whether they perceive the human–robot ratio as being suitable for the service context. This difference is especially significant when it comes to retail personalisation, where a robot can optionally collaborate with a human to give data-informed support, but also remove all previous human personalisation and raise different concerns about trust, authenticity, and control for the customer. The more personal and advisory the service task is the more crucial it is to not only assess whether the robot can carry out a functional task, but to comprehend the concepts of trust, privacy, and social presence.

2.2 AI-Powered Personalisation

In the commercial world, personalisation is the manipulation of the product, communication and experience according with the representations derived from data of the preferences, behaviours, needs of individual customers. The business case is that relevance minimises decision fatigue, enhances the sense of convenience and provides a feeling of knowing what the business wants for the consumer, and not offering a generic list of items. Personalisation technologies are the key function of electronic commerce value creation in delivering better search and decision quality, alleviating information overload, says Adomavicius and Tuzhilin (2005). The retail application of AI personalisation includes these or some other examples – recommendation systems powered by collaborative filtering and machine learning to anticipate customer preferences; dynamic pricing based on customer browsing and purchase patterns; and conversational agents that finely tailor their communication to

each customer. Personalisation is also an interaction when inserted within a service robot, this may be complemented by explanation, persuasion, helping the consumer to state in an accepted declaration, and/or by reassuring, which would change both the meaning of the recommendation and the use of the data. This minimization of information overload holds value for businesses in high-choice retail settings where customers might not want to buy if they do not understand the differences in products or picture out of the many to choose from, how many they are considering.

The most commonly reported results from the personalisation literature suggest that relevance is a key factor in value: when consumers experience something personalised as being relevant and helpful, they find it valuable (Shumanov & Johnson, 2021). Relevancy, then, has a dual role as a cue of competence (appearance of knowing what he or she wants) and a cue of benevolence (appearance of reducing the burden of choice). However, there is also a privacy calculus, as consumers have to also consider "the cost of sharing that data with the company they get personalized service from" (Awad & Krishnan, 2006; Dinev & Hart, 2006, p. 8). Without consent, personalisation can cause discomfort and distrust leading to avoidance behaviour (Bleier & Eisenbeiss, 2015). Intrusiveness tends to arise because of a lack of understanding on behalf of the consumer about why a recommendation has been given, a disclosure of surprising knowledge from the recommendation about the consumer, or because the personalisation steps over the limits of what is considered 'service' and into the realm of surveillance. The personalisation – privacy paradox refers to the conflict between users' claims to a privacy desire and their willingness to disclose information for personalized experiences (Awad & Krishnan, 2006). It is these contextual factors that are precisely what is different when the personalisation is provided from an anthropomorphic robot, as opposed to a digital interface. When there is an embodied encounter, the recommendation cannot be separated from the agent who is providing the recommendation; the encounter is socially staged, physically close, and potentially more memorable than such a digital encounter. This is particularly the case when thinking about retail robotics; whilst the advantages of personalisation may manifest instantaneously in the experience, the disadvantages of data collection, profiling or secondary-use can be less apparent but equally potent.

2.3 Students' Understanding of the Service through AI

Trust is among the most universal factors deemed to have significant impact on consumers' behavior in technologically mediated exchanges. In the case of services where AI is used, users are invariably required to accept what the AI recommends, suggests, or decides.In particular, AI-driven services often involve users accepting decisions, recommendations, and interactions that stem from hidden algorithms. Gefen et al. (2003) made it clear that there are three interrelated components of trust

placed in an online retailer: Ability (the extent to which the retailer is believed to be able to perform as he or she claims), Benevolence (the extent to which the retailer is believed to be kind in his or her treatment of the consumer), Integrity (the extent to which the retailer is believed to behave based on acceptable principles). Pavlou (2003) incorporated trust into the TAM and showed that perceived risk is decreased and transaction readiness in electronic commerce is increased when a transaction has trust. Much like in the current scenario trust this time is acting to mitigate risks with a more complex object of trust, such as consumers trusting the robot and/or the retailer and/or the algorithm and/or the data infrastructure and/or the overall brand ecosystem. They are also applicable to robot-mediated retail, albeit formulated differently, ability as recommendation accuracy, benevolence as the apparent helpfulness of the robot, and integrity in terms of transparency regarding how the data is being used and limitations.

Therefore, AI systems can alleviate the level of mistrust by using anthropomorphic design elements to trigger social cues that kick off cognitive and affective processes of trust normally engaged with human agents. While these cues do not remove any doubt about the algorithm, they can help create a more socially familiar experience, particularly for consumers that may feel that AI systems are cold, opaque, or impersonal. The theoretical account is what comes from CASA theory (Nass & Moon, 2000): Humans involuntary share social rules and social expectations when interacting with computers and robots who have human like qualities. However, Qiu and Benbasat (2009) applied CASA theory to product recommendation agents, finding that anthropomorphic features in the agents led to greater trust in recommendations and lower purchase uncertainty as well as to higher purchase intend. The personalisation achieved by the use of an AI can be reinforced by the use of an anthropomorphic robot, as the social presence of the robot contributes due to its communicative behavior, which gives the impression of attentiveness and care, builds the sense of trust and service. This amplification can be fragile, though, as the consumer can be misled by the robot's "warmness' and consider it as manipulated or false if the later communication fails to do so. This automaticity is important because people need not explicitly think that the robot is a human to make social reactions; when people think that a robot is human, they will think that robo (he, it) feels the same way as they do.

2.4 Privacy Concern and the Embodied Personalisation Context

In the context of personalised AI, privacy concern is the issue when the consumer knows that a system captures, stores and uses data from the user to produce individualised outputs. It thus displays not only a concern for misuse of data but a general

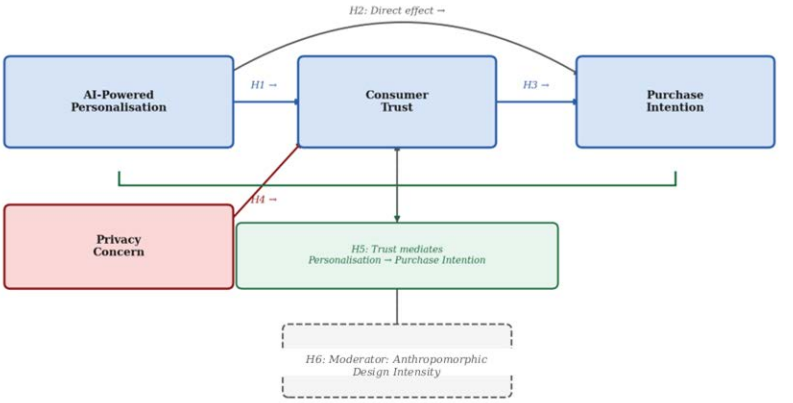
sensitivity to the 'line' of 'rightly and rightly known knowledge' in a commercial enterprise. Dinev and Hart (2006) have found that privacy concern had direct and negative influence on the intention to use online service, mediated by trust. In the anthropomorphic robot arena, the robot has a physical body and faces the human agent; having it ask "how would you like to be called?" or "what would you like me to recommend for you?" in the face of the robot leaves a human agent with the cognitive impression that it is actively listening to him/her, recalling name and wishes, and projecting its own recommendations socially rather than algorithmically generated into a text. This creates a more immediate impression of privacy, as usage of the data wasn't behind a screen but was realised with verbal interaction, posture and eye-to-eye contact as well as conversational moments. The study of social presence and privacy has suggested that there is a stronger sense of intimacy when the entity collecting them is assumed to be social; in human–computer interaction, social norms of confidentiality and discretion are activated differently.The study of social presence and privacy has indicated that the perceived intimacy of how the data are gathered is greater when the data is supposed to be collected by a social entity as opposed to a human–computer interaction (Rosenbaum & Massiah, 2011). This indicates that a sense of 'privacy concern' may be more strongly engaged in anthropomorphic robot experiences compared to similar personalisation experiences in the digital domain. The message is that in order to be accurate and convenient, robot mediated personalisation should also be boundary managing, consent related and self-discretionary.

3. CONCEPTUAL MODEL AND HYPOTHESES

In this chapter, a conceptual model is tested, which is shown in Figure 1. The model is intentionally parsimonious, while omitting components that are only marginally pertinent to the personalisation's relationship to purchase intention; it does so because it assumes that the core psychological mechanism through which personalisation is supposed to affect purchase intention is the only one surveyed and included in the model, acknowledging privacy concern as a counterbalancing force that could reduce trust. The model expands upon the validated empirical framework used by the authors in the context of online retail, and adds anthropomorphic design intensity, which captures the extent to which the physical characteristics, speech and gesture, as well as emotional responses of a service robot resemble human form and behaviour. This moderating construct is particularly relevant as embodiment does not simply impact consumers in a consistent way, across all consumers and all retail contexts, but affects both the level of useful personalisation and the data intrusion in a way that is expected to amplify the effect of the latter. It starts with

the belief that personalisation as a service stimulus is the first prerequisite; this is when the consumer perceives the service as tailored to her needs, relevant to her, and responsive in a personal manner, that sets the positive Trust pathway in motion and initiates the potential privacy Concern pathway.

Figure 1. Conceptual model: AI-powered personalisation in anthropomorphic retail service Encounters Note. H2 shows the direct effect of AI-Powered Personalisation on Purchase Intention, bypassing the trust pathway. H5 shows trust as the mediator of the Personalisation – Purchase Intention relationship (indirect effect = 0.166; 95% CI [0.104, 0.244]). H6 (Anthropomorphic Design Intensity moderator) is a theoretical extension to the robot context and is not empirically tested in the present study.



3.1 H1: AI-Powered Personalisation and Consumer Trust

> **H1:** *AI-powered personalisation delivered by an anthropomorphic service robot positively influences consumer trust.*

The items measured under privacy concern involve concern about collection, storage and use of data. Purchase intention items evaluated the likelihood of making a purchase with the platform's recommendations. All items were adapted from existing scales found in the personalisation and trust literatures (Awad & Krishnan, 2006; Gefen et al., 2003; Pavlou, 2003). As existing measures were adapted to incorporate personalised elements, the content validity was enhanced, yet the importance of the 'Personalisation aspect of AI' called for information that was contemporary with the retail environment and had data-driven aspects rather than content that solely addressed online shopping. People should trust the system generally, as well as trust

it technically for instance, but also trust that it will be fair and in their interest with regards to data usage.

3.4 Analytical Approach

The five-step analysis was conducted as follows: Step 1: reliability analysis by revealing Cronbach's alpha for the data; Step 2: descriptive analysis; Step 3: Pearson bivariate correlation; Step 4: five hypotheses testing of H1–H4 using hierarchical multiple regression analysis; and Step 5: five hypotheses testing of H5 through bootstrapped mediation testing using PROCESS Model 4 (Hayes, 2018), indexed with 5,000 replications. This analytical approach was staged to get the study from measurement adequacy to association and prediction, and then to mediation, which minimized the possibility of doing structural pathways before establishing basic scale reliability and construct relationships. IBM SPSS Statistics (version 17) was used for all analyses. Using bootstrapping was useful, since indirect effects tend to be non-normal, and bootstrapping adds to a good test of mediation beyond what might be thought to be provided by traditional stepwise procedures.

4. RESULTS

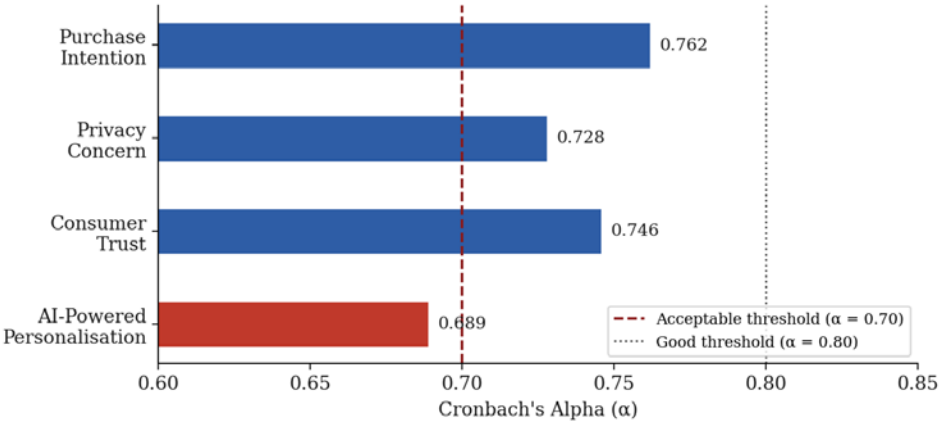
This lesson focuses on reliability and descriptive statistics.This lesson deals with reliability & descriptive statistics.

All 4 constructs are presented in terms of reliability and descriptive statistics in Table 1 and in Figure 2. The results of the preliminary statistics serve as a guide to the interpretation of the following regression and mediation results: if the internal consistency of the measurement is weak or the distribution is skewed, then the structural results are not that reliable. The internal consistency of the Cronbach's alpha values was between .689 and .762, showing acceptable to good internal consistency for an exploratory research context (Nunnally, 1978). The lowest alpha (α = .689) was obtained with the AI-powered personalisation construct, being just below the criterion of .70, which is indicated as a limitation for further fine-tuning of the instrument. Construct means were fairly evenly distributed around the scale's midpoint (M = 3.38-3.40) with no ceiling or floor effects. The pattern is beneficial as it means that instead of all participants having attitudes that were entirely positive or entirely negative toward the use of AI personalisation, trust, privacy concern, or purchase intention, there were enough differences within the sample to enable the meaningful testing of relationships

Table 1. Reliability and descriptive statistics (N = 214)

Construct	Items	Mean	SD	Cronbach's α
AI-Powered Personalisation	4	3.39	0.56	0.689
Consumer Trust	4	3.40	0.61	0.746
Privacy Concern	4	3.38	0.59	0.728
Purchase Intention	4	3.39	0.61	0.762

Figure 2. Internal consistency reliability by construct



Note. Dashed line indicates the conventional acceptable threshold (α = .70).

4.2 Correlation Analysis

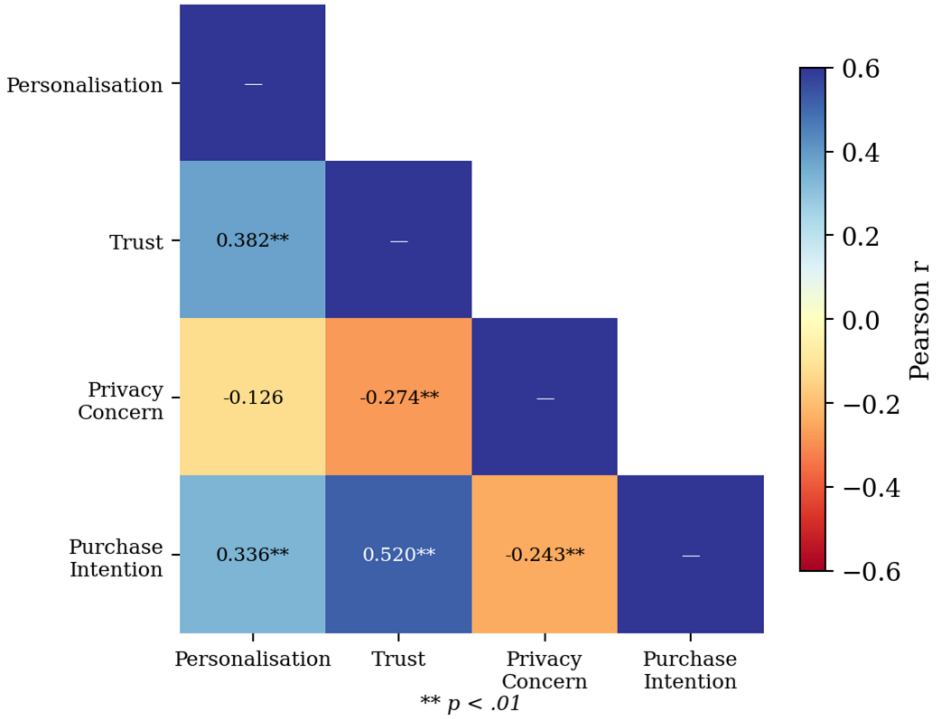
The Pearson correlation matrixs got provided in Table 2 and Figure 3. The correlation results do not represent causality or a causal relationship between the theoretical variables but do offer some initial indication that the variables are related in the perceived direction up to the point of the consideration of the more controlled regression models. This initial support for H1 and H2 through concrete results is linked with the positive and significant correlation between personalisation and both trust ($r = .382$, $p < .01$) and the purchase intention ($r = .336$, $p < .01$). As expected, H3 was supported by strong and positive association between the variables of trust and purchase intention ($r = .520$, $p < .01$). As hypothesized in H4, there was a negative correlation between privacy concern and trust ($r = -.274$, $p < .01$) as well as purchase intention ($r = -.243$, $p < .01$). Although expected, the correlation between the two constructs—personalisation and privacy concern—was not statistically

significant ($r = -.126$, $p > .05$), which validates the empirical distinctiveness of personalisation and privacy concern. Theoretically, this indicates that personalisation, while clearly associated with high privacy concern, does not imply that this concern is necessarily reported by the consumer and that privacy concern is not an evaluative response but is rather an inverse of perceived personalisation. This was the largest bivariate correlation that could be found in the matrix, providing further evidence to support the idea that trust is not merely a peripheral mindset but a central explanatory construct in consumer willingness to engage in positive actions based on AI-mediated recommendations.

*Table 2. Pearson correlation matrix note. ** $p < .01$.*

Variable	**1**	**2**	**3**	**4**
1. Personalisation	**—**			
2. Trust	0.382**	—		
3. Privacy Concern	−0.126	−0.274**	—	
4. Purchase Intention	0.336**	0.520**	−0.243**	—

Figure 3. Pearson correlation matrix of lower triangle heatmap



*Note. ** p < .01. Upper triangle suppressed. Diagonal = 1.000 (not shown).*

4.3 Regression Results

The summary of the models and the regression coefficients are provided in Tables 3 and 4, and in Figure 4. The regression analysis contributes to clarifying which relationship is retained when the variables are considered in relation to each other, providing a stronger meaning than the two variable level analysis provides. Model 1 regressed trust on personalisation and privacy concern, $F(2, 211) = 26.01$, $p < .001$, $R^2 = .198$. The explained variance gives an idea about the amount of trust formation that is explained by the model, and shows that there is still room for other factors in trust formation, including brand reputation, previous experience, perceived security, and readiness of the individual using the technology. Personalisation positively predicted trust ($B = 0.386$, $\beta = .353$, $p < .001$), supporting H1. Privacy concern negatively predicted trust ($B = -0.236$, $\beta = -.230$, $p < .001$), supporting H4. The results showed that personalisation directly positively influenced purchase intention ($B = 0.369$, $\beta = .336$, $p < .001$), thus, supporting H2. Model 3 explained

30.3% of variance in purchase intention, $F(3, 210) = 30.44$, $p < .001$. Trust was the strongest predictor ($B = 0.433$, $\beta = .431$, $p < .001$), supporting H3. It validates the pivotal nature of the trust relationship as the mediating pathway between consumers' positive attitudes toward AI-powered service and their intention to interact with the AI service. Partially mediated by the direct effect of personalisation ($B = 0.174$ and $p = .012$). With the entire model, privacy concern was not a direct and important predictor of purchase intent ($p = .083$), indicating its impact primarily via the pathway of trust. In the practical sense, this would imply that the effect of privacy concern on purchase intention could be lowered indirectly rather than by outright dissuasion from purchase, but by decreasing consumer willingness to accept and follow personalized recommendations. This reduction is really significant because the relationship between the effect of personalisation and trust is so strong that we cannot say that personalisation does not have a personalisation effect via trust, but there is still an effect of personalisation through by the service usefulness of personalized recommendations.

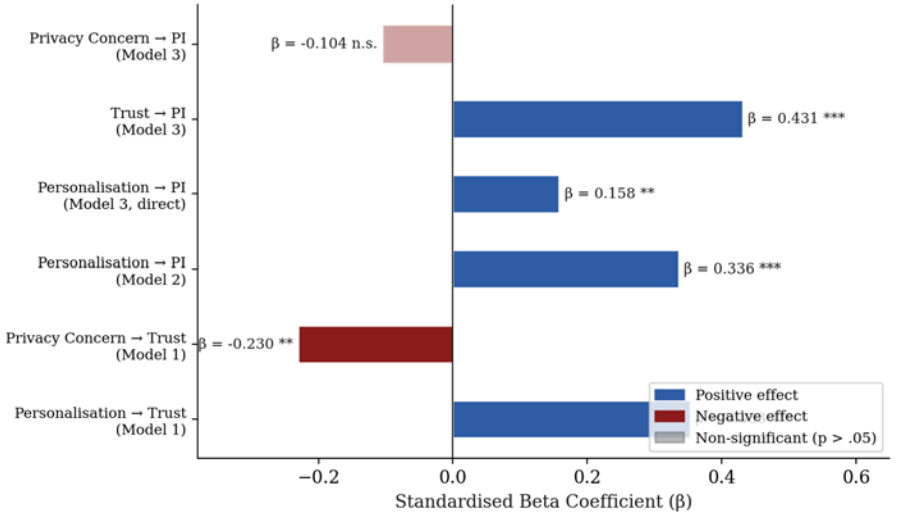
Table 3. Model summary

Model	Predictors	R	R^2	Adj. R^2	SE
Model 1: Trust	Personalisation, Privacy Concern	.451	0.198	0.190	0.547
Model 2: Purchase Intention	Personalisation	.336	0.113	0.109	0.576
Model 3: Purchase Intention	Personalisation, Trust, Privacy Concern	.571	0.303	0.293	0.513

Table 4. Regression coefficients

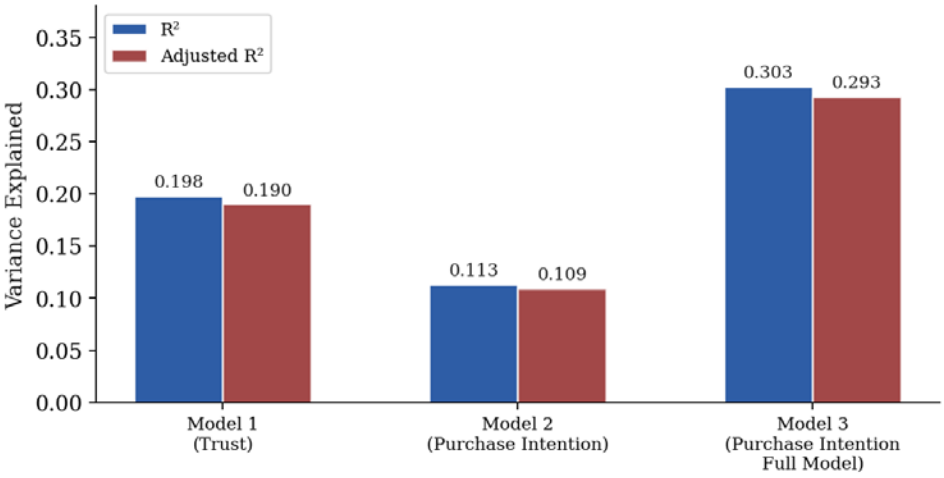
Model	Predictor	B	SE	β	t	Sig.
1	Constant	2.891	0.337	—	8.573	<.001
1	Personalisation	0.386	0.068	0.353	5.676	<.001
1	Privacy Concern	−0.236	0.064	−0.230	−3.698	<.001
2	Constant	2.138	0.244	—	8.773	<.001
2	Personalisation	0.369	0.071	0.336	5.199	<.001
3	Constant	1.692	0.367	—	4.606	<.001
3	Personalisation	0.174	0.068	0.158	2.540	0.012
3	Trust	0.433	0.065	0.431	6.707	<.001
3	Privacy Concern	−0.108	0.062	−0.104	−1.740	0.083

Figure 4. Standardised regression coefficients (β) across models



Note. *** $p < .001$; * $p < .05$; n.s. = non-significant. Faded bars indicate $p > .05$.

Figure 5. R^2 and adjusted R^2 by regression model



4.4 Mediation Analysis

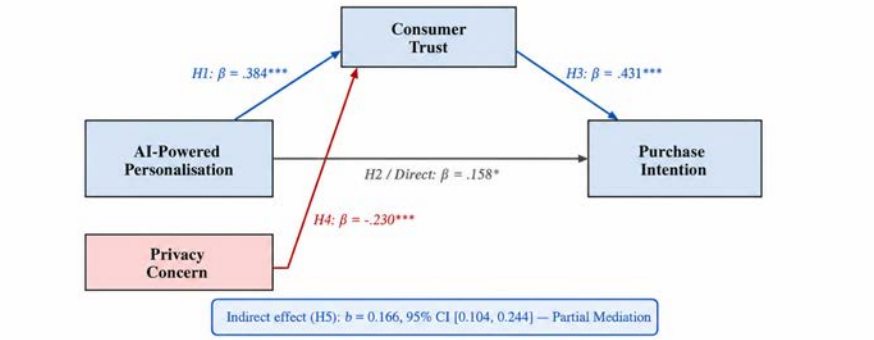
The bootstrapped mediation analyses are provided in Table 5 and in Figure 5. The mediation analysis is the key element of the chapter, as it allows determining

if trust works as the mediating mechanism between personalisation and purchase intention or rather as a correlated variable found in the relationship between the two. The indirect path personalisation had on purchase intention via trust was 0.166 (95% CI [0.104, 0.244]). However, the confidence interval does not contain 0, an indication of partial mediation, and thus H5 is supported. The partial mediation is very informative, as it indicates that there is both a functional mediating effect in terms of prediction of recommendation relevance and a relational mediating effect in terms of trusting personalisation. However, the personalisation effect remained significant (B = 0.174, p = .012), suggesting a partial rather than total mediation effect—the mediation effect of personalisation was found, in addition to the direct relevance pathway, to be through the trust building pathway. The dual pathway becomes significant for the anthropomorphic robot extension as the level of trust may be fed back into the robot, and the meaningfulness of the recommendation remains strong in terms of the fit of the product to the consumer.

Table 5. Bootstrap mediation results (5,000 bootstrap samples)

Effect	Estimate	LLCI	ULCI	Decision
Direct: Personalisation → Purchase Intention	0.174	—	—	Retained (p = .012)
Indirect: Personalisation → Trust → Purchase Intention	0.166	0.104	0.244	Significant mediation
Total Effect	0.369	—	—	Overall positive

Figure 6. Mediation model with standardised coefficients



Note. Partial mediation confirmed: direct effect retained (β = .158, p = .012). Indirect effect = 0.166, 95% CI [0.104, 0.244].

Table 6. Hypothesis testing summary

H	Statement	Result	Evidence
H1	Personalisation → Trust (+)	Supported	B = 0.386, p < .001
H2	Personalisation → Purchase Intention (+)	Supported	B = 0.369, p < .001
H3	Trust → Purchase Intention (+)	Supported	B = 0.433, p < .001
H4	Privacy Concern → Trust (−)	Supported	B = −0.236, p < .001
H5	Trust mediates Personalisation → Purchase Intention	Supported	Indirect = 0.166; 95% CI [0.104, 0.244]
H6	Anthropomorphic design intensity moderates the personalisation–trust and privacy concern–trust pathways	*Proposed but not empirically tested*	Theoretical extension to robot context; empirical testing identified as a future research priority (see Section 9)

Note. H6 is a theoretical proposition developed for the anthropomorphic robot context and was not tested in the present empirical model, which is based on online retail data. Empirical testing of H6 is identified as a priority for future research (see Section 9).

5. THEORETICAL EXTENSION: FROM ONLINE RETAIL TO ANTHROPOMORPHIC ROBOT SERVICE ENCOUNTERS

5.1 How Embodiment Changes the Personalisation–Trust Pathway

The empirical model presented in section 5 proves that AI personalisation has a positive influence on trust and purchase intention in online retail. It is not to be suggested in passing that the same relationships would be entirely replicated in a robot-based retail environment, but to adopt the given relationships as a serious Starting Point for formulating theorising of how the embodied form would shape their strength and significance. This section builds on this work to make claims about how the embodied, human-like nature of the personalising agent qualitatively influences each of the structural pathways in the anthropomorphic robot context. The extension is based on the empirical baseline and informed by CASA theory, social presence research and HRI literature in order to make specific predictions as to how the dynamics of the model should change if personalisation is to be provided by an anthropomorphic robot. This enables the chapter to offer a conceptual contribution without being entirely speculative as to future technologies, but to relate it to actually measured consumer behaviour. The purpose is thus not necessarily to modify the original empirical model but to elucidate its explanatory range by

uncovering the psychology mechanisms that are more relevant when the agent is physically present and socially expressive.

The most impactful shift relates to the way in which users link between personalisation and trust (H1). For a robot mediated encounter, the recommendation may be provided to the consumer in a socially expressive mode, thus where the interpersonal presentation is evaluated together with the evaluation of the recommendation accuracy. In online environment, when the outputs of personalisation are saliently relevant and accurate, the consumer can infer competence and benevolence in the personalisation process. In anthropomorphic robot setting, trust is also cultivated with social cues being expressed by the robot: expressions of attentiveness, voice of warmth, and gestures of affirmation that express care and responsiveness. CASA theory can predict that such social cues trigger processes of building trust that are apparently more immediate and affectively engaging than the cognitive inference process in digital interactions. This means that the pathway for personalization – trust should be stronger and the path to benevolence-based trust stronger compared to competence-based trust for the anthropomorphic robot context. Note that it does not mean that competence is not important, but it does mean that the feeling of being served or taken care of might be a more important factor in establishing trust than the screen in an entirely screen-based approach.

Qiu and Benbasat (2009) offer the first direct empirical validation of this (amplification) effect. Their work is relevant, because they cannot only demonstrate that anthropomorphic recommendation agents can modify the social interpretation of the recommendation system itself, but rather, that {social interpretation} is different than visual presentation. The results from the experiments in this paper that focused on contrast the text-based and anthropomorphic recommendation approach was in favor of anthropomorphic approach; the anthropomorphic approach generated greater consumer trust, lower purchase uncertainty and higher purchase intention, especially when applied to the audiences who are uncertain about the item purchases. The result has a direct application for retail personalisation – in a surfing demonstration using an anthropomorphic robot, a consumer who saw the robot showing some knowledge of his/her likes and dislikes was not only being given a recommendation, but a social communication, which has a stronger effect on increasing the consumers' trust in the robot. It may thus be seen as personalised care, promoting the retail experience as more consultative and relational than one based on a button click.

5.2 How Embodiment shifts the Privacy Concern – Trust Pathway

While predicting a high-to-high score in the anthropomorphic robot context, the pathway of privacy concern – trust is predicted to be stronger than in the online retail context. The answer is because this Embodiment creates a sensationally and socially different way to operate with data, one that becomes more visible, audible and personal. In digital situations, privacy concerns tends to be raised on the basis of inferential realisation that data is being collected, i.e., the activation takes predominantly cognitive form. Experientially, data collection with the anthropomorphic robot context means that the robot faces the consumer and recognizes him by name, remembers the previous visit to the shop and offers suggestions that are clearly calculated based on the information contained in the data. This is because the consumer has no notion that the data is being collected, and sees only what it has to offer as part of a social encounter with the collector that is action sharing with an emotional connotation of being 'in front of face'. When the robot reveals information like their name, previous purchase, loyalty status, prior product inquiry, and so on, without obtaining permission first, the information can lose the sense of privacy and become more of a personal identifier and influence. Confidentiality and discretion rules are triggered by the social norms. A review of social norm activation in the field of HCI suggests that humanlike agents initiated norms (cues) that call for stronger negative responses upon violation, while non-humanlike agents called for less negative responses (Nass & Moon, 2000; Rosenbaum & Massiah, 2011). What this means is that the invasion of privacy in a retail setting when done with a robot may not just be a technical nuisance, but a social faux pas. Whereas robot mediated personalisation can make the data relationship feel socially present, as the consumer experiences the impact of the data usage with the voice and body directed at them.

5.3 The Moderating Role of Anthropomorphic Design Intensity

Following the moderation hypothesis (H6), anthropomorphic design intensity across the personalisation–trust pathway was expected to increase the effect of personalisation on trust, as was the effect of privacy concerns on trust. This is the core theoretical conflict that can be found in the chapter, and that is that higher levels of humanlikeness can lead to higher levels of perceived warmth and responsiveness of personalisation, but humanlikeness can also lead to higher levels of perceived intimacy and intrusiveness of data use. Dual amplification structure will have significant implications for retail robot design. A higher anthropomorphic design intensity will lead to more trust of a personalised encounter; it will also evoke more privacy-driven mistrust of a consumer who is already taking privacy concerns with

him. The net impact on purchase intention will thus rely on the initial level of privacy concerns among consumers. Therefore anthropomorphic intensity as an design attribute cannot not be seen as a universal design attribute value; is better regarded as a multiplier effect for both positive and negative aspects of the anthropomorphic psychological effect which is leadingly to amplify them both.

Regarding the trauma of low privacy concern, high anthropomorphic design is expected to be beneficial: the increased trust its personalisation accelerated should demonstrate to the increased purchase intension. In these instances, the robot can come across as an efficient and interesting assistant, helping the shopping process and lessening decision uncertainty. In certain segments (elevated privacy concern) elevated anthropomorphic design intensities can even be counterproductive: As the impact of the increase in personalisation to build trust for consumers can be overturned by the amplifying impact in the increase in privacy concern to decrease trust. This implies that retailers should not think in the same way when considering how to implement robot use, and should target robots interacting with customers in ways that respect their privacy such as opt-in personalisation, reduction of data recalled and making robot roles less socially connected. One direct practical implication of this prediction is that the anthropomorphic design intensity of a service robot that is deployed in an environment with a high privacy concern should be considered: perhaps a lower intensity would result in greater gains in the commercial aspects of service. The uncanny valley hypothesis also introduces another moderating factor; the high end of the anthropomorphic design intensity spectrum may lead to a negative revival of human-likeness effects due to a negative reaction to high levels of human realism (Mori, 1970; Ho & MacDorman, 2010).

6. ETHICAL DIMENSIONS OF ANTHROPOMORPHIC RETAIL ROBOTS

6.1 Algorithmic Transparency and Disclosure

The introduction of any anthropomorphic service robot (ASR) that can be driven by AI technology opens up sensitive questions of transparency, not limited to the field of digital personalisation ethics. Disclosure is more complicated when there is not just a digital interaction going on, but a live one in which it has to be understood, socially timely and appropriate. In digital environments, transparency tools like privacy policies, cookie reminders communication, etc. promote a nominal distance between the data collection system and the social interaction/social process of the service encounter by the consumer. In the anthropomorphic robotic context, this separation is merged into the social encounter and there is no formal

disclosure moment as such: the personalisation is offered to the robot during the social interaction itself. When a purchase history can influence a recommendation, a consumer may not be aware that the robot is accessing a loyalty programme database, a behavioural tracking system or real time facial recognition feed. Such a lack of clarity can have a negative impact on trust even if access to/reuse of data is legal, as users are likely to hold an opinion about the experience based on their notions of respect, consent, and control of their personal boundaries, rather than the legal obligations alone.

Ethics of disclosure in this context is not only about the need for privacy policies to be present but ensuring that the personalisation ability of the robot is captured in the social register of the service encounter. In other words, disclosure needs to be designed to be included as part of the interaction with the person, not as part of the paper. Some commercial deployments have in fact resorted to letting the robot reveal its personalisation mechanism first, within the first paragraph, or the first few words, of the interaction, in a natural conversational way: a statement that no consumer could possibly read, but might be considered to be ethically sound – and potentially more business-charging – because it is in the first paragraph of the interaction, or in the first few words. It can also help to convey the impression of control if the consumer is left with an option of continuing without personalisation, explanation or limitation of information given to the robot.

6.2 Emotional Manipulation and Affective Computing

The ability of anthropomorphic robots to recognise and respond to emotion via affective computing (through facial expression recognition, voice pitch detection and physiological monitoring to deduce emotional state and adjust accordingly) raises questions around ethics that simply cannot be mirrored in digital personalisation. These are amplified because emotions are personal, unverifiable, and potentially game-changers at times when consumers are feeling unconfident, fatigued, or frightened or when they are under social pressure. A robot's detection of hesitation coupled with a higher level response (such as accentuating the positive, reassuring or suggesting an enhancement) is more direct and personally intimate than the equivalent algorithmic adjustment in the digital world. The moral dilemma is whether it is unfair to manipulate or simply the robotic version of the attentive human salesperson who reads into their emotional state, and adapts and responds accordingly. It is a response that is partially dependent on the level of disclosure, partially on the commercial interest, and partially on the vulnerability of consumers. It also relies on the consumers' understanding/consumer confidence, or on the intensification of persuasion, exploiting hesitation or undermining consumers' actual freedom of choice. Especially when the financial commitment, personal vulnerability, health,

identity, or social status are at stake, the adaptation the robot takes may influence choices when people are plotting to buy, pushing them to make a decision at a vulnerable moment.

6.3 Brand Authenticity and the Automation of Care

Consumers who feel that a brand is consistent, authentic, and true to its values are more likely to become loyal and advocate for the brand (Huang & Rust, 2018). Anthropomorphising robots push the boundaries of authenticity by giving the impression of a personalised care, but functioning by using automated rules and rulesets, databases and algorithmic inferences. Brands known for their values of human connection, craft and personalised care may end up faced with an 'authenticity paradox', as the anthropomorphic robot can offer personalisation which is more consistently accurate and delivered more efficiently than the human customer service representative, but the warmth of the social behaviour of the robot may be seen as at odds with the brand's promise of human connection, craft and personalised care. A robot who seems a knowledgeable assistant, is transparent about his artificial intelligence and truly assists consumers in navigating their complex product assortment is more likely to be seen as authentic than one that appears to act warm to people based on techniques they can guess. Instead, the big question for any retailer is whether the shopping bot should look and act like a human... at any price.

7. MANAGERIAL IMPLICATIONS AND STRATEGIC RECOMMENDATIONS

7.1 Calibrating Anthropomorphic Design for Trust Optimisation

This core theoretical implication, drawn from the chapter, is the non-linear, context-dependent linkages between anthropomorphic design intensity and consumer outcomes. Therefore, managers are encouraged to make designing a robot a strategic decision related to the redesign of a service, and not just a novelty investment or a straightforward automation initiative. Intelligent retailers and robots designers should not fall for their intuitive sense that more human-like robots are better ones. The more relevant question is, what human-like cue works better for the service task, the product category, and the consumer likely's expectations of privacy. Retail bodies will require different levels of anthropomorphic design intensity in a particular deployment based on three factors: target customer population's privacy concern profile, data sensitivity of a product category, and brand's positioning on the human connection–efficiency continuum. In product categories that do not require

consumers to spend much to evaluate their quality, a moderately anthropomorphic robot with strong personalisation capability and explicit disclosure process would probably generate the highest level of trust-building effect and most positive purchase intentions included in this chapter's empirical trust model. In high-suspense sectors, the premium retailers would find a lower degree of anthropomorphic design intensiveness with a greater focus on competence signalling stimuli rather than warmth signalling stimuli to yield better results. For instance, robots that are reliable, communicate parts of the product features and how the data will be utilized might have a better credibility than those trying to imitate the emotional dynamics of people. A friendly, moderately humanlike robot may be effective on a retailer into the sale of every day low threat products, whereas a company that sells a sensitive product or high involvement products could profit from a extra subdued and symbolic look that highlights the professionalism and control of the person.

The penetration of transparency into the commercial strategy.8.2 The commercial movement of transparency.

Furthermore, the ethical rationale for disclosure of robot personalisation capabilities is strengthened by a commercial rationale; the retailer's capacity to boost consumer confidence is demonstrated in showing transparency with regard to personalisation mechanisms, by giving consumers confidence in the retailer's respect of the consumers' right to know how their data is being used. Transparency should therefore not be looked at as a compliance obligation, but rather as part of the customer journey which will help build trust. Perceived control over data, or the consumer's sense of his or her ability to control, correct or opt out of their personalisation is always reported to have a stronger influence on trust than the fact that the data is not collected (Dinev & Hart, 2006). For the anthropomorphic robot scenario, this becomes a design guideline: robots must let the consumer know about their own personalisation capabilities, provide an ability for the consumer to have interactions without personalisation, and give the consumer a way to review and to manage the data they consume. The urgency of encountering a robot could otherwise result in consumers feeling that their use of the data was necessary or out of their control without the chance to input their consent.

Anthropomorphic service robots serve as brand agents, and their attitude, interaction and communicative behaviors represent and convey the brand values during all interactions with the consumer. They ought to be treated as seriously as their advertising campaigns, customer messages, staff training, and the user experience of their digital offerings. Retailers must attempt to design a robot as a brand governing process, not only as a technical procurement selection. The personae of the robot should be designed in the same manner as all of the other messaging assets of the brand, both with regard to its name and to its visual image, voice, gestural register and style of conversation. It involves checking for credibility of the persona, if the

persona is familiar enough, and whether it uses personal data in a manner understandable to the target customers. Transitions from multiple persona and the brand's stated values are authenticity threats to brand equity, while consistency provides opportunities to connect with brand values at scale across consumers. Therefore, the cross-functional governance responsibilities across the marketing functions, data protection, customer experience, operations and technology functions should be considered.

This chapter has conceptualized and empirically derived an integrated model for analyzing the effects of anthropomorphic personalised service robot use on consumer trust, privacy concern, and purchase intentions in a retail service interaction. The framework indicates a personalisation effect that is not always a positive one; it is shaped by the consumers' understanding of data-based adaptation process: a helpful recognition versus an intrusive monitoring. The main services it brings are: First, it fills the gap between the literature on anthropomorphism and the literature on marketing personalisation by analyzing both the HC and marketing personalisation literatures in a similar framework; second, it provides an empirically validated structural model that shows the magnitude and direction of the key relationships and offers a baseline quantitative point of comparison to theoretise and compare robot-context effects; and third, it introduces anthropomorphic design intensity as a theoretically motivated design moderator variable that can generate novel and practically actionable predictions regarding conditions under which anthropomorphic personalisation will help versus hinder the commercial efficacy of AI personalisation. Those contributions have been made with the idea of aiding the design and development of academic research, and informing decision-making by managers doing pragmatic business, in a field where the business matures faster than the theory, measurement and governance.

The chapter also adds to ongoing debates about the ethics of anthropomorphic service robots, including this work by identifying three specific ethical challenges, namely algorithmic transparency, emotional manipulation and authenticity, where design and governance must take specific form and actions, not exclusively through generic frameworks of AI ethics. The analysis indicates that what counts as the ethical design and the design that is effective commercially are not necessarily at odds with one another; in the case of robot-mediated personalisation, it is possible that being created as an ethical design is one process in which trust and purchase intention may be maintained.

This chapter has stressed the theoretical progression and development, but it also has identified some priority areas for empirical studies. The moderating effects proposed in this manuscript should be evaluated in the context of real or simulated robot-life experiences: Experimental manipulations of anthropomorphic design intensity along with explicit measures of perceived social presence, privacy concern,

and trust should be used in such studies. Trust in anthropomorphic service robots must be studied over repeated service encounters, which may result in trust being created through affective response to social cues in the first instance, but being more stable and cognitively elaborated in repeated service encounters, where differentially successful personalisation level and weighings on privacy concerns may create trust. The interaction between anthropomorphism and privacy concern varies with other cultures in which anthropomorphic robots have a longer commercial history and are more culturally familiar than in European contexts where norms of data privacy have raised privacy awareness and GDPR norms are more adhered to. Experimental designs across cultures are necessary in order to test how the expectations of the model apply to the different situations. Lastly, there is a need for validated, anthropomorphic personalisation-context-specific measurement instruments; the constructs of anthropomorphic design intensity, social presence–mediated trust and embodied privacy concern need psychometric development beyond the adaptation of scales of digital commerce. These would be able to differentiate between trust in the robot's ability to perform elevated social functions and trust in the data processing processes of the retailer and trust in the predictive algorithm's recommendations. Comparative work would be useful to determine the nature of the trust-construction proven to be available from anthropomorphism, whether it is culturally universal or culturally contingent, depending on local histories of technology acceptance, retail services norms and privacy regulation.

The anthropomorphic service robot is not just a new sensation of technology. It is a new, person-orientated AI application where automation, personalisation, embodiment, and brand communication are (as it were) flowing together in one experience. Through the activation of social cognitive architecture of consumer trust, it is a new class of brand agent that cannot be replicated by digital systems but involves risks of privacy aversion and authenticity scepticism to be controlled by design and governance. What is crucial for the countries' retailers is not only the academic relevance of this approach, but also the commercial urgency to implement these systems as the number of retailers in the countries making use of such systems grows. Retailers who comprehend such complexity will better be equipped in designing robotic service encounters that will not just be efficient and persuasive, but also trusted, transparent and suitable to consumers' expectations.

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