

## **Consumer's Acceptance of Retail Service Robots: Mediating role of Pleasure and Arousal**

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### **Abstract**

Service robots, driven by cutting-edge technologies have the potential to revolutionize service delivery and enhance customer experiences leading to service innovation, particularly in the retail sector. The acceptance of retail service robots is a topic of increasing interest, yet there are contradicting influencers of consumers' intention towards these robots. Specifically, the mediating role of pleasure and arousal in the relationship between consumers' perceptions of retail service robots and their behavior intention is not adequately explored. Therefore, this study aims to investigate the mediating role of pleasure and arousal in the relationship between consumers' perceptions of retail service robots and their usage intention in retail settings. Quantitative data was collected from 323 participants using online snowball sampling method and analysed using PLS-SEM technique. Results indicated that subjective norms, technological self-efficacy, habit and attitude had a strong influence on behavior intention. While the emotional domain of pleasure played a more significant mediating role compared to arousal. Overall, the integration of Theory of Reasoned Action (TRA), self-efficacy theory, and the pleasure, arousal and dominance (PAD) model allows for the advancement of theoretical framework and deeper understanding in the field of human-robot interaction. These findings also provide practical insights for businesses to understand the influence of consumer emotions and utilize this knowledge to design marketing strategies, service encounters, and experiences that enhance their usage of service robots.

### **1.0 Introduction**

Service robots, as new service providers, have the potential to improve service outcomes and customer experience and may already be revolutionising the service delivery process when combined with cutting-edge technologies like artificial intelligence (Li et al., 2022). Service robots are system-based autonomous and flexible interfaces that interact, communicate, and provide services to the clients of an organisation, according to Wirtz et al. (2018). Service robots are changing client experiences (like empowerment) and service outcomes (like customization and personalisation) as emerging service providers integrate new and advanced technologies. Robots can give services with certain qualities including ease, availability, and empathy, according to studies (Kabaddi et al., 2019; Chiang and Trimi, 2020). Development of service robots has received attention in many nations because to its potential for service innovation, particularly in the wake of the COVID-19 epidemic (Chiang and Trimi, 2020). According to projections from MarketsandMarkets (2023), the market for service robotics is anticipated to increase from USD 41.5 billion in 2023 to USD 84.8 billion by 2028, growing at a CAGR of 15.4% throughout that time. Service robots can "perform useful tasks for humans or equipment excluding industrial automation application" (International Federation of Robotics, 2020) thanks to artificial intelligence (AI) and sensory technologies.

Robots are dispersing beyond the manufacturing and scientific fields and are now pervasive in the retail and service sectors (Barnett et al., 2014; Iocchi et al., 2016). A burgeoning movement seeks to create robots that do tasks other than service automation, such as serving as public sales employees, product advisors, and shopping assistants (Barnett et al., 2014). According to Li et al. (2010) and Lin et al. (2016), these robots are intended to produce enticing high-tech shopping experiences and provide individualised customer care to encourage involvement in retail businesses. In the retail sector, Lowes in San Francisco, for instance, debuted an autonomous retail service robot called "LoweBot" to assist consumers in finding the things they're looking for and to answer their queries. For the purpose of making future business decisions, LoweBot can also monitor inventory in real time and pinpoint sales trends (Forbes, 2018). The use of advanced robotic technologies in retail is changing, which has both advantages and disadvantages for consumer researchers, engineers, psychologists, roboticists, business owners, and public policymakers (Lin et al., 2016).

To aid in forecasting and explaining technology acceptance across a wide range of fields, researchers have developed technology usage intention models. For instance, the theory for reasoned action (TRA) was created by Ajzen and Fishbein in 1980 to forecast and explain behaviour in a wide range of contexts. In order to ascertain users' purpose to use technology, TRA is useful because it is very general and "designed to explain virtually any human behaviour" (Ajzen and Fishbein, 1980, p. 4). According to Ajzen and Fishbein (1980), the TRA describes how a number of social and attitudinal elements might forecast people's intentions to engage in a behaviour. According to the theory, which makes the supposition that humans are rational decision-makers, our behavioural intentions can be predicted in part by (1) our attitudes towards a behaviour and (2) our evaluations of how other people see a behaviour. The theory also included behavioural and attitude predictions. Users' intentions towards technology have frequently been explained using TRA (Andoh, 2018). We reasoned that TRA was necessary since using a retail service robot's services is a behaviour, not a technology. In light of the fact that TRA is a theory used to explain human behaviour based on personal norm beliefs.

However, consumer attitudes towards innovations are just as important to adoption as their thoughts and feelings about them (Valor et al., 2022). Emotions such as pleasure and arousal are crucial to decision-making (Lerner et al., 2015), consumer behaviour (Bagozzi et al., 1999), and societal transformation (Barbera-Tomas'et al., 2019), according to research from a variety of social scientific fields. Risk perceptions are influenced by emotions (Lerner and Keltner, 2001), and embracing new technology is frequently dependent on these perceptions (Rogers, 1983). Emotions can also provide the motivational energy—the inner drive needed for adoption—since innovation adoption often entails a volitional, effortful choice (Bagozzi et al., 1999). In fact, emotions can be witnessed by or shared with others, hence influencing the diffusion of innovations (Mimoun et al., 2021; Valour, 2020). Emotions are also essential for interpersonal communication and social dynamics (Turner and Stets, 2005; Van Kleef et al., 2010). Therefore, social emotional expression is crucial for determining whether or not social and technological innovations are accepted (or rejected) (Barber' a-Tomas et al., 2019; Mimoun et al., 2021). In this study pleasure and arousal were examined as mediator besides accepting as determinants of intention.

The research also suggests that self-efficacy may affect adoption, particularly in the setting of consumers (Kulviwat et al., 2014). Having confidence in one's capacity to carry out a specific behaviour is known as self-efficacy (Bandura, 1977). The emotional and cognitive reactions of people to innovations can be significantly influenced by one's confidence in one's capacity to handle them because high technology advancements are frequently perceived as complicated. Thus, it would seem to be important to look at how self-efficacy functions as a precursor to cognition and affect in order to better understand how consumers accept new technologies. A construct that appears to have potential as a significant external component of TRA is self-efficacy. Self-efficacy can be understood as an individual's self-assurance in their capacity to employ an innovation to achieve a desired behaviour in the context of technology adoption (Pedersen, 2003). Self-efficacy should be a major factor in high

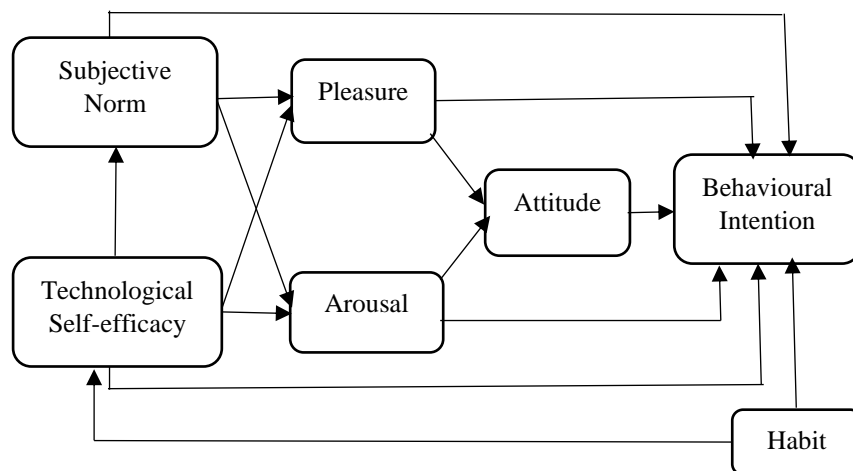
technology adoption because it makes sense that people who are more confident in a product will have more favourable attitudes towards it.

## 2.0 Theoretical Background

### 2.1 Theory of Reasoned Action (TRA)

Because the TRA exhibits a strong and accurate predictor of customer behaviour in a variety of situations, numerous studies have supported its adoption. The TRA might be able to explain any form of conduct. The TRA has been used in investigations by a number of scholars (Bidin et al., 2014). The TRA, developed by Fishbein and Ajzen in 1975, is regarded as a generally applicable model in both online shopping and social psychology (Ashokkumar and Nagarajan, 2021; Ramayah et al., 2004), marketing (Kumar et al., 2023). The TRA emphasises intention as the precursor to behaviour. According to Bidin et al. (2014), it is assumed that such intents capture the motivational elements that affect behaviour. According to Ajzen (1991), intentions are indicators of the amount of effort people are ready to put in when performing certain behaviours. The TRA postulates two distinct factors that determine intention, including attitudes towards behaviour and subjective norms. According to Ajzen and Fishbein (1980), attitude refers to how positively or negatively an individual views a particular behaviour. One of the elements affecting attitude is the behavioural belief, which involves assessing the importance or potential outcomes of a particular conduct (Ajzen and Fishbein, 1980). According to Ajzen (1991), subjective norms are social pressures that influence how an individual should act in light of his or her opinions of the person or group in question.

In the research framework, TRA is chosen for two main reasons. First, it was presumed that people want to act in a way that enables them to meet the expectations of others and achieve favourable outcomes. In other words, people don't only do what they want to do; they also consider what their friends and family think, especially those who are part of a larger culture. To put it bluntly, people don't just act in accordance with their personal preferences; rather, their social context has an impact on how they act. The acceptability or approval of a specific activity displayed by the people near to the person may have a significant impact on the person's conduct intention. A very small number of studies have examined the effect of attitude on shifting intentions when subjective norm and attitude were evaluated together in a model, despite the fact that earlier studies had demonstrated that attitude is a significant factor in customers' behaviour intentions (see Blodgett et al., 1993).



### 2.2 The Theory of Self-efficacy

The theory of self-efficacy has been used in a variety of fields, including psychology (Bandura, 1977; Ajzen, 2002), mobile learning (Chao, 2019), information systems (Compeau and Higgins, 1995), and consumer behaviour (Gupta and Bostrom, 2019). It has been around for close to 40 years. Recently, it has been used in marketing (Manyiwa and Brennan, 2012), consumer behaviour (Garlin and McGuiggan, 2002), B2C e-commerce (Al-dalahmeh et al., 2018), and online shopping (Maheshwari et al., 2019). The theory is based on research conducted in the field of SCT by Bandura and his colleagues in psychology (Bandura, 1977). Self-efficacy is concerned with assessments of what one can do with their skill set. The fundamental tenet of self-efficacy is that people behave on the basis of their own internal ideas about themselves. Because it can affect decisions about what behaviours to engage in as well as the level of effort and perseverance displayed in attempting such behaviours, self-efficacy plays a crucial role in self-motivation (Barling and Beattie, 1983). Hence, we use self-efficacy as another factors combining with TRA.

### **2.3 Pleasure, Arousal and Dominance (PAD)**

The PAD model was proposed by Mehrabian and Russell in 1974 to explain how a person's emotions influence how they perceive their environment and how they react to it. The three basic emotional reactions that show how people perceive their physical surroundings are pleasure, arousal, and dominance (Chang et al., 2014). These emotional responses are also viewed as independent dimensions for illuminating people's feelings. According to Yang et al. (2020), pleasure is described as a person's sensation that can range from extreme delight or ecstasy to severe misery or agony. The levels of pleasure are happy-unhappy, annoyed-pleased, and satisfied-unsatisfied. The term "arousal" refers to a person's level of energy, stimulation, and excitement, which can range from sleep to exhilaration. According to Chang et al. (2014), the states of arousal are sleepy-wide awake, excited-calm, and relaxed-stimulated. Similar to this, dominance is defined as the degree to which a person can regulate their emotions, or their capacity to limit their behaviour, which can be characterised as persuasive, independent, and commanding (Hall et al., 2017). The PAD theory has been applied to a number of situations, including the intention to use social media (Hall et al., 2017), online games (Huang et al., 2017), emotional branding in an online setting (Yang et al., 2020), food delivery apps (Kumar et al., 2021), and mobile libraries (Zhao et al., 2022).

Due to two factors, we used the PAD theory in this study when discussing the use of retail service robots. The PAD framework is suitable for assessing the consequences of emotional reactions connected to the context of employing service robots, to start with. Second, because the effects of emotional response are typically studied in technology usage settings and as a result, the knowledge of it is limited in the use of retail service robots, the support of robots during the selection of products from the retail shop until the completion of payment or transactions can greatly influence the emotional response of the customers. These emotional reactions influence consumer behaviour, which includes decisions about what to buy and whether to stay in or leave a situation (Eroglu et al., 2001). Therefore, these feelings might influence how consumers behave in the future. The consumer's involvement with the robots develops emotional connections to their usability and aesthetic appeal. These robot characteristics can elicit a range of emotional responses from consumers, who may then return to the retail service robots after interacting with them several times. The relationship between the consumer and the robots gets stronger and more sustainable as the frequency and length of use of the robots rises (Yang et al., 2020). We picked the PAD paradigm for the use of retail service robots because this creates an emotional nexus between the customers and the robots.

We used arousal and pleasure as an organismic state for our study. Dominance is not included in the study model in accordance with other studies (like Jeon et al., 2016), mostly for two reasons. First,

because most scholars view dominance as a result of pleasure or arousal (such as Chang et al., 2014), scholars have not fully understood the dominance dimension and its outcome (Park et al., 2020). According to Russell's (1980) advice, pleasure and arousal are the two main dimensions that best capture the breadth of emotional experiences and the emotions that are displayed in response to environmental cues. Chebat and Michon (2003) research in the areas of psychology also supported the validity and reliability of these two emotional dimensions.

## **2.4 Review of related literature and formulation of hypotheses**

### **2.4.1 Subjective Norm**

Subjective norms are one of the elements that also considerably positively affect the emotions of consumers while they are engaging in consumption (Alsaggaf and Althonayan, 2018). People who hold prominent positions and crucial roles in a community believe that their connections give them access to more affiliations and benefits for society. As a result, these individuals have stronger emotional bonds and are more inclined to engage in communal activities (Hsu and Lin, 2008). According to Latané (1981), social elements have an effect on customer emotions and behaviour. When a client adopts the preferences and viewpoints of others, positive feelings are evoked (Aertsens et al., 2009; Bamberg et al., 2007). Additionally, when someone has the power to approve or disapprove of another person's actions, they might have a highly powerful impact known as normative influence. However, Hynie et al. (2006) supported the effect of subjective norms on a person's emotions and behaviour. As a result, we put forth the following hypotheses:

Hypothesis 1a: Subjective norms influence consumer pleasure positively.

Hypothesis 1b: Subjective norms have a beneficial effect on customer arousal.

Many scholars define subjective norms as the presumptive social pressure to engage in or refrain from a particular action while discussing them. Ajzen (1991), Al-Nahdi et al. (2015), Han and Kim (2010), and Tonglet et al. (2004) all support the idea that subjective norms have a large impact on behaviour. According to Phungwong (2010), consumers' perceptions of social pressure affected their buying intentions and choices. The sources of pressure, including family, friends, and even political parties, were examined by Kalafatis et al. in 1999. Additionally, even the societal norms as a whole have an impact on a customer's intentions and choices regarding a purchase. It is significant to highlight that recent research (Gupta and Ogden, 2009; Iakovleva et al., 2011) has found that subjective norms can be utilised to anticipate customer intentions. For instance, Nysveen et al. (2005) investigated the influence of normative pressures in the context of using mobile phones. According to Nysveen et al. (2005), individuals frequently give other people's perspectives more weight when it comes to technology. As a result, we put forth the following hypothesis:

Hypothesis 2: Subjective norm has significant effect on behavioural intention.

### **2.4.2 Emotion**

Studies on emotions have also covered how the interior of the business and its associated emotional displays affect a customer's decision to make a purchase (Dawson et al., 2002; Swinyard, 1993; Donovan and Rossiter, 1982;). Gountas & Gountas (2007) further mentioned that the influence of emotions on attitude has been endorsed by psychological professionals. One method that is frequently employed to assess how consuming emotions affect consumer behaviour is the cognitive method (Nyer, 1997). Furthermore, it is evident that comprehending customer demands and their corresponding responses to those needs depends on both the aspects of cognition and emotions (Eroglu et al., 2003). For a better understanding of this, we concentrate on the separate factor that had an effect on cognitive appraisal in addition to the primary factors of the impact, which were affective or emotional reactions (Bigné et al., 2008). An important stage in developing a positive attitude for a strategy or course of

action is the state of delight that a user experiences while completing a purchase (Penz and Hogg, 2011). As a result, we put forth the following theories:

Hypothesis 3a. Pleasure has a significant effect on attitude.

Hypothesis 4a. Arousal influences attitude in a significant way.

According to Mehrabian and Russell (1974), the customer's behaviour was influenced by emotional feelings that resulted from a variety of acts. These behaviours include intention to buy (Ha and Jeong, 2010), the desire to recommend (Wu et al., 2008), and the desire to act in ways that convey a variety of attitudes (Eroglu et al., 2003). Similar to this, Ladhari et al. (2008) discussed how consumer sentiment significantly influenced conduct and choices. Therefore, according to the studies of Ladhari et al. (2008), Lee et al. (2011) and Namkung and Jang (2009) it is safe to say that customer emotions have the potential to significantly affect both behaviour intentions and purchasing decisions. Studies by Namkung and Jang (2010), Lin and Liang (2011), and Han and Back (2007) stated that customers' behavioural intentions are directly impacted by their emotional responses. As a result, we put forth the following hypotheses:

Hypothesis 3b: Pleasure has a significant effect on behavioural intentions.

Hypothesis 4b: Arousal has a significant effect on behavioural intentions.

### **2.4.3 Technological self-efficacy**

An individual's self-efficacy relates to their confidence in their ability to carry out the behaviours required to produce particular performance outcomes. Technology's sense of self-efficacy is drawn from Bandura's (1986) definition of self-efficacy, which is seen as a sense of confidence in one's ability to perform appropriately in conditions under control. Technology self-efficacy, or the capacity to use technology without worrying about any issues (Doan, 2021; Cai et al., 2019). Additionally, it predicts how well a user will be able to use technical inputs to get desired results (Cebeci et al., 2020; Bailey et al., 2017). It has long been believed that playfulness and enjoyment are significant precursors of perceived efficacy (Csikszentmihalyi, 1975; Webster & Martocchio, 1992). For instance, it has been discovered that self-efficacy with regard to computer technology significantly influences affect (pleasure). Particularly, people who have strong self-efficacy tend to find adopting new technologies more enjoyable (Compeau and Higgins, 1995). This is explained by the "optimal flow" idea, which contends that mastering the necessary abilities raises one's level of task satisfaction (Csikszentmihalyi, 1990; Hoffman and Novak, 1996). The enjoyment dimension includes fun and playfulness, which have been linked in MIS research to experience and self-efficacy (Webster and Martocchio, 1992).

Self-efficacy can affect arousal because people are more likely to be positively aroused (excited and enthusiastic) when they believe they possess relevant abilities or are capable of carrying out a particular task. As an illustration, Bandura (1977) and Henry and Stone (1994) discovered that self-competence had a favourable impact on one's susceptibility to self-arousal. Similar to this, Gist and Mitchell (1992) proposed that a feeling of personal competence in overcoming obstacles is likely to increase interest in the activity and result in emotional arousal. Gordon et al. (2014) study confirmed that self-efficacy affects pleasure and arousal.

Self-efficacy enables people to judge how easy or difficult it is to use technology to complete a certain activity (Purnomo & Lee, 2013). Researchers tried to examine the association between technological self-efficacy and technology usage intention (Pan, 2020) and Kumar et al. (2020) examined the effect of self-efficacy on subjective norm and behavioural intention. Therefore, we put forth the following hypotheses:

Hypothesis 5a: Technological self-efficacy has significant effect on pleasure.

Hypothesis 5b: Technological self-efficacy has significant effect on arousal.

Hypothesis 5c: Technological self-efficacy has significant effect on subjective norm.

Hypothesis 5d: Technological self-efficacy has significant effect on behavioural intention.

#### **2.4.4 Habit**

Habit is an automatic behaviour that significantly influences how well an information system is used (Limayem et al., 2007). While the majority of studies stated that habit repetition frequency is the key factor to identify, some researchers disagreed, claiming that habit is a non-reflective behaviour of how a person responds to a circumstance (Huang, 2017). Consequently, paying attention to how a person naturally executes an action rather than how frequently they do so is important. The minimal cognitive effort needed by consumers to commence participation in an activity is also reflected (Limayem et al., 2007; Seo and Ray., 2019). Omar et al. (2019) confirmed the favourable correlation between Habit (HT) and instructors' plans to adopt mobile technology. The actual technological use of teachers was positively impacted by habit (Kim and Lee, 2020), and it also encouraged educators' and students' BI to accept and utilise mobile internet (Wong et al., 2019). Nikolopoulou et al. (2021) used habit as a determinants of usage intention of mobile internet Kumar et al (2020) study confirmed that use habit has significant effect on self-efficacy and behavioural intention. In this study, it was hypothesised that consumer attitude towards using robots for retail services is predicted by habit. The consumer's practise of using robots to make everyday purchases from retail establishments may encourage its acceptance. Therefore, we put forth the following hypotheses:

Hypothesis 6a: Habit has significant effect on technological self-efficacy.

Hypothesis 6b: Habit has significant effect on behavioural intention.

#### **2.4.5 Attitude**

According to Ajzen (2001), the focus of studies on human behaviour is attitude. When sentiments are discussed, favorability is referred to. Ajzen and Fishbein (1980) added that attitude might be thought of as either disliking or liking a thing when characterising it. Dabholkar (1994) emphasised the significance of attitude in guiding particular behavioural intents in addition to its function in defining alternatives. According to Zanna and Rempel (1988), attitudes are created by the interaction of affective feeling and cognitive belief. According to Fazio (2000), after the process of forming an attitude was finished, it was stored in human memory, which in turn encouraged and improved the decision-making process. The notion of an assumption of the TRA customer's behavioural intentions coming from attitude or appraisal was mentioned by Ajzen and Fishbein (1980) and Barnes (2002). According to Oliver (1980), a customer's attitude is the outcome of their pre- and post-experience with a good or service. Several studies in the field of consumer research, including Burton and Creyer (2004), Burton et al. (2006), and Kozup et al. (2003), mentioned how a person's attitude affected their decision to make a purchase. Similar effects of social online platforms were covered by Shih et al. (2013). Yang and Yoo (2004) made a contribution to the field when they described how attitudes influenced behaviour intentions. As a result, we put forth the following hypothesis:

Hypothesis 7: Attitude has significant effect on behavioural intention.

#### **2.4.6 Mediating role of pleasure and arousal**

Numerous research (e.g., Han and Jeong, 2013; Kim and Moon, 2009; Namkung and Jang, 2010) have suggested that emotions that affect consumption operate as mediators between crucial elements in a customer's views and subsequent behaviour. Taking into account the hypothesised direct relationships, the study seeks to investigate whether pleasure and arousal may act as a mediator in the relationship between subjective norm and technological self-efficacy in relation to robotic process services.,

Previous studies such as Zhai et al., (2020), Bigne et al., (2020) and Fu et al., (2020) that showed the mediating role of an organism in the interaction between stimuli and response in the SOR theory served as a guide in the quest to investigate the mediating impact. On the relationship between website qualities and behavioural reaction, the existent literature has also recognised the mediating roles of pleasure and arousal (e.g., Yang et al., 2020; Loureiro & Ribeiro, 2014; Huang et al., 2017). Furthermore, some recent studies also tried to examine the mediating effect of pleasure and arousal (Kumar et al., 2021; Wang and Liao, 2021; Ang and Leong, 1997). According to the above discussion we set forth the following hypotheses:

Hypotheses 8a: Pleasure mediate the association between subjective norm and behavioural intention.

Hypotheses 8b: Pleasure mediate the association between technological self-efficacy and behavioural intention.

Hypotheses 9a: Arousal mediate the association between subjective norm and behavioural intention.

Hypotheses 9b: Arousal mediate the association between technological self-efficacy and behavioural intention.

### **3.0 Methodology**

#### **3.1 Research design and data collection**

Our study focuses on individual user experience with retail robots, chosen specifically as it best aligns with our objective to understand the subjective experiences and behaviours of individual users while interacting with robots in a retail environment (Venkatesh et al., 2012). This approach grants us detailed insights into the factors impacting the adoption and continued use of robots in retail services.

Data was collected from a demographically diverse group of respondents located in Kuala Lumpur, the Federal Territory of Putrajaya, and Selangor, signifying the economic heart of Malaysia. These individuals represent our target audience: users with direct experience using robots in retail settings. This target group significantly influences most, if not all, independent variables (such as their attitudes, subjective norms, pleasure, and arousal) due to their direct interaction with retail service robots. Furthermore, they have a vested interest in the dependent variable (intention to use robots) as it directly impacts their retail experience.

The data collection commenced by reaching out to a pre-defined group of individuals from the target audience, using the snowball sampling principles (Atkinson et al., 2011). These initial respondents then referred the survey to others in their networks with similar experiences, resulting in a total of 323 respondents from 557 invitations (a response rate of 57.98%). This sample size aligns with Bentler and Bonett (1980) guideline of having at least 10 times the number of respondents as parameters in the model.

We utilised digital platforms, including Messenger, WhatsApp, and Viber, to distribute the survey link. This approach ensured a geographically dispersed sample without requiring direct respondent contact. A structured, closed-ended questionnaire was employed for easy completion, fostering greater participation (Winsted & Patterson, 1998).

#### **3.2 Measuring Instrument**

The questionnaire encouraged introspective responses and adapted items from previous studies to suit our research context (Table 3). A preliminary review of the questionnaire by 10 individuals helped refine it for better relevance and clarity. In addition a back translation process was applied to the

questionnaire to ensure clarity and relevance in the Malay context, following the method recommended by Brislin (1970).

Participants expressed their agreement with each statement on a Likert scale, ranging from 'strongly disagree' to 'strongly agree'. The constructs incorporated were taken from prior research, ensuring their validity and reliability (Table 3). In addition to these constructs, demographic data was also collected for a more detailed analysis. We used SPSS version 26 to analyse descriptive data on respondent demographics. Furthermore, the measurement model's validity and reliability, along with the structural model, were tested using PLS-SEM. This methodology is in alignment with our research question and facilitates the examination of the relationships between the constructs involved, addressing our research objective (Creswell, 2012).

#### **4.0 Data analysis and results**

Of 323 respondents who completed the questionnaire respondents Table 2, The gender distribution of our sample was approximately 59.44% females and 40.56% males. Comparatively, the gender distribution in Malaysia is approximately 48.32% females and 51.68% males, according to data from Malaysia's Statistics on Population (2017). While our sample has a higher proportion of females than the general population in Malaysia, the discrepancy is not substantial, and our findings should still be relevant and applicable to the larger population. 39.62% were single, while the majority (60.38%) were married. The largest age group among respondents was 39–54 years old (33.13%), followed by 23–38 years (45.82%) and 18–22 years (21.05%).

##### **4.1. Common method bias**

Common method bias (CMB) was investigated in this research by both procedural and statistical measures (Podsakoff *et al.*, 2012). To begin, the analysis used established metric systems from prior studies. The final questionnaire is easier to understand and has fewer free-form questions. A well-defined beginning condition for the sample frame was employed throughout the data collection phase of the online survey to guarantee that only qualified participants filled out the survey. We protected the respondents' privacy and identities by using online snowball sampling. Participants were also asked for their phone numbers and email addresses to help verify the reliability of the data collected (Baltar and Brunet, 2012). The online poll includes contained filtering questions to ensure a representative sample (Tehseen *et al.*, 2017). As a result, when designing the survey questions, the risk of common method bias was minimise (MacKenzie and Podsakoff, 2012). Common method variance (CMV) was investigated using Harman's single-factor test, a statistical adjustment. According to the study's results, the percentage of variance related to a single cause is less than 50% (MacKenzie and Podsakoff, 2012). The low method variation in the data suggests that there was no serious CMV issue. Furthermore, the impact of CMV on the intercorrelations of latent variables was assessed using the correlations matrix method. There is less than a 0.9 correlation between any pair of constructs. The results of the investigation show that this is not an instance of the prevalent method bias (Pavlou and El Sawy, 2006).

##### **4.2 Evaluation of measurement model**

Firstly, in order to assess the measurement model, convergent validity is examined (Hair *et al.*, 2021). Factor loadings, composite reliability, average variance extracted, and Cronbach's Alpha are only some of the outcomes of the validity investigation shown in Table 1. In addition to discovering factor loadings bigger than 0.60, we also found AVE values larger than 0.5. According to the research, an AVE of 0.50 or above indicates that at least 50% of the items' variation is explained by the latent variable (Edeh *et al.*, 2023). As for the CR values that indicate how well the item indicators reflect the latent construct, results varied from 0.720 to 0.887, which is above the recommended value of 0.70 (Ringle *et al.*, 2022). The CA values that quantify the extent to which the items in the scale measure the same underlying

construct were also found to be above the suggested threshold of 0.7 (Ringle *et al.*, 2022). Hence, none of the items was removed as all items were deemed to be reliable and demonstrated adequate convergent validity.

**Table 1: Cronbach Alpha, Composite Reliability, AVE**

Determinant Factors	Factor Loading	CA ( $\alpha$ )	CR	AVE
<b>Subjective Norm</b> (Binyamin et al., 2018)		0.718	0.719	0.640
SN1: My friends think I should use Robotic service at retail stores.	0.795			
SN2: People think I should use Robotic services at retail stores	0.834			
SN3: I would like to do what others thinks I should do.	0.771			
<b>Technological Self-efficacy</b> (Binyamin et al., 2018)				
TSE1: I have skills needed to use robots for retail services.	0.743	0.790	0.791	0.614
TSE2: I learned how to use robot service in retail setting.	0.815			
TSE3: I know about robots.	0.808			
TSE4: If I face a problem in robots, I usually know what should I do.	0.766			
<b>Arousal</b> (Xu et al., 2020)		0.886	0.887	0.745
AR1: I feel enthusiastic while using robot services.	0.874			
AR2: I feel excited when I am using robotic services.	0.854			
AR3: I feel energized to use robotics services.	0.878			
AR4: I feel exhilarated to use robot services.	0.847			
<b>Pleasure</b> (Xu et al., 2020)		0.728	0.734	0.647
PL1: I enjoy the fun of using robots.	0.782			
PL2: I feel happy when I use robots.	0.838			
PL3: I experience the emotion of pleasure when I am using robots.	0.792			
<b>Habit</b> (Nikolopoulou et al., 2021)		0.802	0.809	0.626
HBT1: The use of robots for service purposes has become a habit for me.	0.779			
HBT2: I am addicted to use robots for service purposes.	0.775			
HBT3: Using robots' services has become natural to me.	0.837			
HBT4: I must use robot for retail services.	0.772			
<b>Attitude</b> (Alam and Sayuti, 2011)		0.782	0.793	0.614
ATT1: Choosing robots for retails service is a good idea.	0.854			
ATT2: I like using robots for retail services.	0.723			
ATT3: My general opinion about using robot services is favourable.	0.767			
<b>Behavioural Intention</b> (Binyamin et al., 2018)		0.790	0.817	0.615
BI1: I would like to use robots in the future if I have the chance.	0.697			
BI2: I would recommend using robots to others.	0.851			
BI3: I will continue using robots in retail setting in the future.	0.796			

After examining the convergent validity of the model, the next step was to examine its discriminant validity. Discriminant validity is achieved by determining whether there is sufficient separation between the various conceptions (Ringle *et al.*, 2022). The heterotrait-monotrait (HTMT) ratio of correlations is a widely accepted approach in social science studies (Henseler *et al.*, 2015). When comparing the average correlations between items to the correlations between items that measure distinct constructs, HTMT is the latter. Table 2 below displays HTMT results, demonstrating that all values are below the cutoff value of 0.85, establishing discriminant validity (Henseler *et al.*, 2015).

**Table 2: Heterotrait-Monotrait Ratio (HTMT)**

	Arousal	Attitude	Behavioural Intention	Habit	Pleasure	Subjective Norm	Technological Self-efficacy
Arousal	-						
Attitude	0.485	-					

Behavioural Intention	0.575	0.718	-				
Habit	0.540	0.591	0.602	-			
Pleasure	0.545	0.592	0.805	0.600	-		
Subjective Norm	0.624	0.549	0.503	0.558	0.764	-	
Technological Self-efficacy	0.441	0.427	0.602	0.296	0.434	0.372	-

### 4.3: Hypotheses Testing Results and Discussion

After the evaluation of the measurement model provided sufficient evidence of reliability and validity, the structural model estimates are examined to assess the hypothesized relationships among the constructs. To assess the hypotheses H1 to H9, the standardised path coefficients, significance levels and the effect size ( $f^2$ ) of the variables are illustrated in Table 3 below.

**Table 3: Structural Model and Hypotheses Testing Result**

Hypotheses	STD Beta	STD Error	t-Values	P-Values	Significance (p<0.05)	$f^2$
H1a: SN → PL	0.506	0.047	10.700	0.000	Supported	0.358
H1b: SN → AR	0.428	0.047	9.177	0.000	Supported	0.036
H2: SN → BI	-0.162	0.054	2.997	0.003	Supported	0.242
H3a: PL → ATT	0.316	0.057	5.539	0.000	Supported	0.103
H3b: PL → BI	0.502	0.059	8.580	0.000	Supported	0.340
H4a: AR → ATT	0.236	0.062	3.810	0.000	Supported	0.058
H4b: AR → BI	0.120	0.065	1.842	0.066	Not Supported	0.021
H5a: TSE → PL	0.185	0.048	3.855	0.000	supported	0.048
H5b: TSE → AR	0.249	0.055	4.564	0.000	Supported	0.082
H5c: TSE → SN	0.282	0.061	4.595	0.000	Supported	0.086
H5d: TSE → BI	0.206	0.067	3.087	0.002	Supported	0.079
H6a: HBT → TSE	0.247	0.050	4.958	0.000	Supported	0.065
H6b: HBT → BI	0.106	0.046	2.318	0.020	Supported	0.017
H7: ATT → BI	0.189	0.051	3.730	0.000	Supported	0.059
H8a: SN → PL → BI	0.254	0.041	6.259	0.000	Supported	
H8b: TSE → PL → BI	0.093	0.026	3.526	0.000	Supported	
H9a: SN → AR → BI	0.051	0.028	1.865	0.062	Not Supported	
H9b: TSE → AR → BI	0.030	0.019	1.605	0.109	Not supported	

The study thoroughly scrutinised the total impacts of both the independent and dependent variables. It confirmed the first hypothesis, stating that subjective norms have a beneficial effect on customer pleasure ( $\beta = 0.506$ ; t-value = 10.7). Moreover, subjective norms were also shown to have a positive influence on consumer arousal ( $\beta = 0.428$ ; t-value = 9.177). This finding corroborates earlier studies that propose that subjective norms typically generate positive emotional responses, like pleasure and arousal (Hew et al., 2020; Satish et al., 2021). Subjective norm is frequently seen as a result of normative

belief and the desire to comply (Vo et al., 2022), hinting that abiding by subjective norms often provokes positive emotions.

For the second hypothesis for determining the behavior intention, subjective norm is confirmed to have a significant but negative effect ( $\beta = -0.162$ ;  $t\text{-value} = 2.997$ ). Consistent with the intention-based theory, subjective norms in general often puts pressure on customer intention (Al-Nahdi et al., 2015; Jain, 2020). However, the result in Table 3 shows that the postulation of subjective norms may not always lead to a favorable formation of behavior intention. As found in this study, when subjective norm was high, it reduced the tendency for consumers to use robotic services.

The third hypothesis examined the direct influence of pleasure on attitude and behavior intention. The results of H3a and H3b support that pleasure positively influences attitude ( $\beta = 0.316$ ;  $t\text{-value} = 5.539$ ) and it also has a positive and significant effect on behavior intention ( $\beta = 0.502$ ;  $t\text{-value} = 8.580$ ). As for the fourth hypothesis, the results confirm that arousal has a direct and positive effect on attitude ( $\beta = 0.236$ ;  $t\text{-value} = 3.810$ ), however, it doesn't have any relationship towards behavior intention ( $\beta = 0.120$ ;  $t\text{-value} = 1.842$ ). Interestingly, this could mean that pleasure has a more significant impact towards behavior intention compared to arousal and emotional arousal doesn't seem to foster the usage of service robots. Similar to the findings of Subero-Navarro et al. (2022), service robots that are imbued with non-humanlike appearances may arouse short-term effect on user interest but it does not translate to a usage intention.

The following hypothesis evaluates the impact of technological self-efficacy. The results indicated that technological self-efficacy has positive and significant influence on pleasure ( $\beta = 0.182$ ;  $t\text{-value} = 3.855$ ), arousal ( $\beta = 0.249$ ;  $t\text{-value} = 4.564$ ), subjective norm ( $\beta = 0.282$ ;  $t\text{-value} = 4.595$ ) and behavior intention ( $\beta = 0.206$ ;  $t\text{-value} = 3.087$ ). This finding is aligned with most of the past studies supporting the notion that personal competence in overcoming obstacles is more likely to increase pleasurable feelings, interest, intention and play a positive role in the use of technology (Yener et al., 2021).

Moving forward, both the results of H6a and H6b support the postulated hypothesis that habit plays a significant role in influencing technological self-efficacy ( $\beta = 0.247$ ;  $t\text{-value} = 4.958$ ) and behavior intention ( $\beta = 0.106$ ;  $t\text{-value} = 2.318$ ) towards retail service robots. Habit repetition reduces anxiety towards technology or also known as technophobia while encouraging automaticity, hence improving preference for service robots over retail employees (Kim et al., 2022). This study also confirms the relationship between attitude and behavior intention ( $\beta = 0.189$ ;  $t\text{-value} = 3.730$ ) as previously established in TRA model by Fishbein and Ajzen (1975).

In the study, the results for H8a demonstrated that pleasure acts as a mediator between subjective norms and behavioural intention ( $\beta = 0.254$ ;  $t\text{-value} = 6.259$ ) as well as between technological self-efficacy and behavioural intention ( $\beta = 0.093$ ;  $t\text{-value} = 3.526$ ). However, arousal did not exhibit a mediating effect between subjective norms and behavioural intention ( $\beta = 0.051$ ;  $t\text{-value} = 1.865$ ) or technological self-efficacy and behavioural intention ( $\beta = 0.030$ ;  $t\text{-value} = 1.605$ ). This indicates that pleasure and arousal are distinct emotional responses with varying impacts on behavioural intentions. Aligned with the Theory of Planned Behavior (Ajzen, 1991), which suggests that subjective norms influence behaviour through emotional responses. Empirical research supports the mediating role of pleasure between subjective norms and behavioural intentions (Xu et al., 2022). However, the role of arousal remains debatable, with some studies endorsing its mediating function (Thakur & Srivastava, 2015) and others refuting significant effects (Lee & Huang, 2020). This study contributes valuable empirical evidence to the ongoing debate regarding the nuanced roles of pleasure and arousal in shaping behavioural intentions.

## **5. Discussions**

### **5.1. Discussion on the findings**

In addressing the research question – ‘What factors influence the acceptance and usage of service robots in the retail sector?’ - the findings of this study provide clear insights. They highlight the roles of

subjective norms, pleasure, arousal, technological self-efficacy, and habit in shaping consumers' attitudes and behavioural intentions towards the adoption of service robots.

Contrary to the general assumption that subjective norms lead to favourable behavioural intention (AL-Nahdi et al., 2015; Jain, 2020), we found a negative influence of high subjective norms on behavioural intentions (H2). This sheds light on an alternative perspective, suggesting that high societal pressures might deter consumers from using robotic services.

Additionally, while prevailing theories often link arousal to the adoption of technological innovations (Subero-Navarro et al., 2022), we found no significant relationship between arousal and behavioural intentions (H4). This adds a layer of complexity to our understanding of emotional responses in the context of service robot adoption and implies the need to treat arousal and pleasure as separate, impactful dimensions.

Our study expands on the current understanding of technology adoption theories. For instance, we provide a nuanced view of the TRA model by Fishbein and Ajzen (1975) by elaborating on the roles of subjective norms, pleasure, arousal, technological self-efficacy, and habit.

## **5.2. Contributions of this study**

### **5.2.1. Theoretical contributions**

This research makes noteworthy strides in the study of service robots, customer experience, and behavioural intention. Our investigation bridges an existing knowledge gap by employing a novel integration of the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975), self-efficacy theory (Bandura, 1977), and Pleasure, Arousal, Dominance (PAD) theory (Mehrabian & Russell, 1974). This holistic framework elucidates the intricate dynamics between subjective norms, attitudes, self-efficacy, and emotional responses (pleasure and arousal) in shaping behavioural intentions towards retail service robots. The innovative integration of PAD theory offers a fresh perspective, underscoring the essential role of emotional experiences in shaping behaviour intentions beyond pure cognition. In line with the findings of Subero-Navarro et al. (2022), we demonstrate that personal emotions, especially pleasure, have a more significant influence on behavioural intentions than arousal, particularly in the context of service robot interaction. Our work also confirms the interplay between technological self-efficacy and subjective norms, where individuals' perception of competence and societal influence to use robots are significantly mediated by the experience of pleasure. Furthermore, it underscores the influence of societal norms (a component of TRA) on the individual's interaction with technology, providing a comprehensive understanding of the complex socio-technical system of retail service robot adoption. In coherence with previous works, like the study of human-computer interaction by Shao et al. (2022), our work expands the understanding of how technology and human behaviour interact in a retail environment.

### **5.2.2. Practical implications**

The practical implications of this research cater to a variety of stakeholders, including retail managers, Information System (IS) project managers, product designers, and others involved in the design of customer experiences and services. (1) For retail managers, our research recommends the alignment of marketing campaigns and service encounters with social norms and a focus on positive emotions, resonating with the suggestions of Solomonson (2015), to foster stronger brand relationships and improve the customer experience. (2) IS project managers can leverage these insights to develop strategies that harness the power of subjective norms and self-efficacy, increasing acceptance and adoption of new technologies as suggested by Srinivasan and Yadav (2023), and Maran et al. (2022). (3) In line with Van Quaquebeke et al. (2022) perspective on emotional design, product designers can benefit from these findings by crafting user-friendly interfaces that enhance self-efficacy and stimulate positive emotional experiences, thereby boosting customer satisfaction and engagement. By bridging the gap between theoretical understanding and practical application, our research provides a multi-faceted perspective that caters to the socio-technical needs of the JDS readership. Our research emphasises the need for an integrative approach to decision-making in the adoption of service robots,

reinforcing the importance of considering both human and technological factors, which is in line with the focus of JDS.

### **5.3.Limitations and future directions**

While this study provides valuable insights, it is not without its limitations. The concentration on consumers from three populous states in Malaysia may limit the generalisability of the findings. Future investigations should encompass a diverse range of geographic and demographic groups to capture potential cultural nuances influencing consumer acceptance of service robots. The reliance on self-reported data may have introduced response bias. Employing a mixed-methods approach could offer richer data and more comprehensive insights. While the sample size of this study is considerable, it is pertinent to note that a larger and more diverse population would enhance the robustness of the results and provide a more accurate reflection of the population. This research prioritises pleasure and arousal as the main emotional drivers of consumer acceptance, leaving room for exploration of other emotions like fear or anger. The investigation of various robot attributes and their impact on consumer responses is another avenue for future research. Moreover, the complexity of consumer-robot interactions could be further explored by examining additional mediating elements such as trust, perceived utility, and perceived risk, which are likely to provide valuable insights. The field of consumer-robot interaction is continually evolving, necessitating interdisciplinary collaboration. Given the diverse features and capabilities of service robots, future research could delve into how specific features shape emotional responses, attitudes, and intentions to use the technology. This research builds upon existing literature in the Decision Systems community, offering pertinent insights into technology adoption within the retail sector. It is our hope that our findings will fuel further inquiry and discussion on this topic. However, we acknowledge that the exclusion of certain aspects, such as feelings of control or influence during robot interactions across different tasks, services, and cultural contexts, may limit our understanding. These areas warrant further investigation in future studies.

### **6.Conclusion**

In conclusion, our study offers novel theoretical and practical contributions that fill the knowledge gap in the socio-technical aspect of service robot adoption in retail. We adopt an integrated theoretical framework incorporating TRA, self-efficacy theory, and PAD theory to provide a comprehensive understanding of behavioural intentions towards retail service robots. This innovative approach addresses the knowledge gap identified in the introduction and extends previous works (Ghali, 2022; Martins et al., 2023; Phillips- Wren et al., 2019; Srinivasan & Yadav, 2023; Watson & Webster, 2020), emphasising the interaction between technology and human behaviour in a retail environment. Practically, our research offers actionable recommendations for decision-makers in retail management, IS project management, and product design. We underline the role of societal norms, user self-efficacy, and positive emotional experiences in shaping the acceptance and adoption of service robots. This provides a timely guide for professionals in these domains to strategise and implement technology effectively, thus achieving enhanced customer experiences and improved retail operations.

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