Understanding Gen Z shoppers' interaction with customer-service robots: a cognitive-affective-normative perspective

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Abstract

Purpose – Large supermarket chains are adopting customer-service robots to improve service delivery in physical stores. Successful deployment of these robots depends on shoppers' willingness to interact with them,

requiring an understanding of influencing factors. This study, grounded in the Cognitive-Affective-Normative (CAN) theory, seeks to systematically explore the factors influencing Gen Z shoppers' willingness to interact with customer-service robots.

Design/methodology/approach – A hybrid approach combining Structural Equation Modeling (SEM) and Necessary Condition Analysis (NCA) was employed to analyze survey data collected from 945 Gen Zs in the Czech Republic.

Findings – The results from SEM highlight significant cognitive, normative, and affective factors that influence the intention of Gen Z shoppers to interact with a customer-service robot. Specifically, cognitive factors such as effort and performance expectancy, along with normative factors like subjective norms, emerged as critical determinants. Furthermore, affective factors such as technology anxiety and positive emotions significantly influence users' readiness to use customer-service robots for service requests. The study also underscores that positive emotions, effort expectancy, performance expectancy, and subjective norms are vital prerequisites for interacting with customer-service robots.

Originality/value – The originality of this work lies in its two significant contributions to the burgeoning field of SRs in retail literature. First, it extends the CAN theory to the context of SRs among Gen Z shoppers in Czechia, thereby enriching the existing literature on SRs in retail. Second, by employing a hybrid analytical approach, our research offers both empirical and methodological advancements, providing rigorous insights crucial for enhancing the understanding of the pivotal factors influencing shoppers' interactions with SRs in physical store environments.

Keywords Cognitive-affective-normative theory, Generation Z, NCA, SEM, Service requests, Service robots

Paper type Research paper

1. Introduction

The retail industry is currently experiencing a significant transformation through the integration of customer-service robots (SRs) in major brick-and-mortar stores. Market forecasts predict a substantial increase in the value of retail robots, soaring from 7.1 billion USD in 2020 to nearly 60 billion USD by 2028 (Coherent Market Insights, 2021).

Scientific literature suggests that the integration of retail robots and innovative technologies can be a key distinguishing factor for retailers, significantly influencing their efforts to provide distinct digital customer experiences in physical stores (Brengman and Willems, 2023; Noble *et al.*, 2022). However, the successful integration and widespread acceptance of these robots depend on consumers' willingness to engage with them during their shopping experiences (cf. Alam *et al.*, 2024).

Despite the increasing scholarly interest in SRs within the retail industry (Gauquier *et al.*, 2021; Park *et al.*, 2021; Song and Kim, 2022; Song *et al.*, 2022; Subero-Navarro *et al.*, 2022), current literature lacks substantial research addressing the factors that influence shoppers' willingness to interact with SRs, especially among young adult consumers such as Gen Zs. This study aims to fill this gap by providing insights to store management and other stakeholders about the key factors influencing shoppers' intentions to interact with SRs. More broadly, this article addresses the growing need in retail literature for further exploration of consumers' acceptance of SRs from sound theoretical perspectives and across diverse demographic contexts (Alam *et al.*, 2024; Ma *et al.*, 2023; Roy *et al.*, 2023; Song *et al.*, 2022). This is crucial as there is still limited understanding of consumers' perceptions of robot-assisted interactions, particularly within the retail industry (Alam *et al.*, 2024; Roozen *et al.*, 2023).

Drawing from established literature (García-Milon *et al.*, 2020, 2021; Pelegrín-Borondo *et al.*, 2016, 2017), this study employs the Cognitive-Affective-Normative (CAN) theory to develop a model elucidating the determinants influencing Gen Z shoppers' inclination to interact with SRs. The selection of the CAN theory for this investigation is based on its well-documented explanatory power (e.g. see García-Milon *et al.*, 2020; Pelegrín-Borondo *et al.*, 2016, 2017). Furthermore, previous research on SRs has employed this theoretical framework in the Spanish retail landscape (Subero-Navarro *et al.*, 2022), prompting the need to extend its applicability to diverse retail environments such as Czechia.

Significantly, our utilization of the CAN theory among Gen Z shoppers introduces novelty compared to related research, such as the study by Subero-Navarro *et al.* (2022), as it focuses on a significant demographic known for its eagerness to embrace new technologies (Ma *et al.*, 2023). Gen Z is generally defined as those born between 1994 and 2012 (Pew Research Center, 2019). Notably, Gen Zs are widely recognized for their enthusiasm in experimenting with emerging technologies like SRs (cf. Romero and Lado, 2021). Therefore, by targeting this distinct demographic group, retailers can gain crucial insights into the factors influencing early technology adopters' interactions with SRs in the retail environment.

Specifically, in addition to identifying cognitive and normative factors such as effort expectancy, performance expectancy, and subjective norms related to Gen Z shoppers' willingness to interact with SRs, our research explores two critical affective dimensions: technology anxiety and positive emotions related to SR usage. These factors, to the best of our knowledge, remain largely underexplored in consumer research on SRs, particularly within the retail sector in Czechia and other Central European markets.

Accordingly, our main objective in this article is to systematically explore the influence of effort expectancy, performance expectancy, technology anxiety, positive emotions, and subjective norms on Gen Z shoppers' willingness to interact with SRs (as measured by willingness to use SRs for making service requests).

Our investigation stands out by employing a combined approach of partial least squares structural equation modeling (PLS-SEM) and the innovative technique of Necessary Condition Analysis (NCA) (Dul, 2016) to analyze the relationships under study. This methodological approach aligns with recent calls in the literature (Cheung *et al.*, 2022; Duarte *et al.*, 2022; Magno and Cassia, 2024; Richter *et al.*, 2020) advocating for hybrid approaches to provide more robust and compelling evidence. Such methodological advancements are particularly relevant for decision-makers, such as retail managers, seeking comprehensive insights.

Notably, the current study not only identifies the critical determinants behind Gen Z shoppers' interactions with SRs, known as "should-have factors," but also utilizes NCA to unveil the essential prerequisites, referred to as "must-have factors," for such interactions. This approach broadens the scope of the investigation, providing a more comprehensive understanding of the factors influencing interactions with SRs among Gen Z shoppers. Our research, therefore, stands as one of the pioneering attempts to utilize a hybrid approach in examining the influential determinants of Gen Z shoppers' inclination to engage with SRs in store environments.

In summary, our research offers two significant contributions to the burgeoning field of SRs in retail literature. Firstly, it extends the CAN theory to the context of SRs among Gen Z shoppers in Czechia, thus complementing and adding to the growing literature on SRs in retail. Secondly, by employing a hybrid analytical approach, our research provides both empirical and methodological contributions, offering rigorous insights crucial for enhancing understanding among both the academic and managerial communities regarding the pivotal factors influencing shoppers' interaction with SRs in the physical store environment.

The current study is structured as follows: research model and development of hypotheses, followed by methods, data analysis, and results. Finally, the discussion and implications of the study are introduced, followed by the study limitations and avenues for further research.

2. Research model and development of hypotheses

The Cognitive-Affective-Normative (CAN) model serves as a comprehensive theoretical framework for understanding individuals' intention to adopt new products (Pelegrín-Borondo *et al.*, 2016, 2017). Recently, interest in applying the CAN model has grown, with

scholars utilizing it to explain adoption intentions across various domains, including healthcare technology (Pelegrin-Borondo *et al.*, 2021), technological implants (Pelegrin-Borondo *et al.*, 2017), spa and medical tourism (García-Milon *et al.*, 2020; Pelegrín-Borondo *et al.*, 2020), and retail contexts (Subero-Navarro *et al.*, 2022). These studies demonstrate the model's predictive utility in elucidating cognitive, affective, and normative factors influencing technology adoption and purchase intentions.

The CAN model builds upon foundational theories such as the Technology Acceptance Model (TAM) and its extensions (TAM2), the Unified Theory of Acceptance and Use of Technology (UTAUT and UTAUT2), and the Theory of Reasoned Action (TRA) and its extensions. It integrates affective factors into these models, expanding their scope. Notably, existing research (cf. Pelegrin-Borondo *et al.*, 2017) highlights the significance of TAM variables—perceived usefulness and perceived ease of use—as key cognitive factors in technology decision-making. Additionally, normative influences like subjective norms and affective states like technology anxiety, negative and positive emotions, are considered important (Pelegrin-Borondo *et al.*, 2017). Studies by García-Milon *et al.* (2021) and Pelegrin-Borondo *et al.* (2021) emphasize the role of performance expectancy and effort expectancy in enabling technology adoption decisions. This emphasis guided the authors in choosing these two primary cognitive variables.

Effort expectancy pertains to the perceived simplicity of utilizing a given technology (Giovanis *et al.*, 2019; Venkatesh *et al.*, 2003), whereas performance expectancy represents individuals' confidence in a technology's capability to fulfill their objectives (Lyu *et al.*, 2023; Venkatesh *et al.*, 2003). Previous research has shown a positive relationship between these cognitive factors and individuals' intention to adopt technology (Giovanis *et al.*, 2019; Pelegrín-Borondo *et al.*, 2020; Raza *et al.*, 2017; Subero-Navarro *et al.*, 2022). In the context of this study, willingness to use SRs for making service requests simply reflects individuals' plans to utilize SR for making service requests at the store. Therefore, consistent with past research, we propose that the cognitive factors of both effort and performance expectancy will positively contribute to shoppers' intention to engage with SR, leading to the following hypotheses:

H1. Effort expectancy has a positive relationship with the willingness to use SR for making service requests.

H2. Performance expectancy has a positive relationship with the willingness to use SR for making service requests.

Alongside cognitive factors like effort expectancy and performance expectancy, this study investigates affective variables, specifically technology anxiety and positive emotions, to enhance the understanding of the determinants to engage with SRs, which subsequently influences their (actual) behaviors. Technological anxiety, a negative affective emotion, is characterized by fear or apprehension towards using technology (Kwarteng *et al.*, 2023; Tsai *et al.*, 2019). Prior research indicates that technology anxiety stems from unfamiliarity with the technology and a lack of confidence and skill to use it effectively (Kwarteng *et al.*, 2023; Tsai *et al.*, 2019).

Emotions play a crucial role in shaping shoppers' actions, either by encouraging or altering behaviors (Subero-Navarro *et al.*, 2022). Situations eliciting positive feelings are typically rated favorably, while those evoking negative emotions are viewed negatively (Arora *et al.*, 2022; Pelegrin-Borondo *et al.*, 2017). Han *et al.* (2007) note that shoppers often choose options that minimize the risk of experiencing negative emotions such as uncertainty, fear, and worry about the technology's performance.

For instance, in the healthcare context, Pelegrin-Borondo *et al.* (2017) found that anxiety, as well as positive and negative emotions, significantly influenced the intention to adopt

technological implants among Spanish respondents. Similarly, in the context of SR, positive emotions such as pleasure and arousal have been found to positively influence shoppers' intention to use SR in retail stores (Kim, 2021; Subero-Navarro *et al.*, 2022). Building on this discussion within the CAN model framework, we propose that negative emotions such as nervousness and discomfort with SR use may hinder shoppers' intentions engage with SR in stores. Conversely, positive emotions such as joy, fun, happiness, and pleasure may positively influence individuals' willingness to interact with SRs, leading to the following hypotheses:

H3. Technology anxiety has a negative relationship with the willingness to use SR for making service requests.

H4. Positive emotions have a positive relationship with the willingness to use SR for making service requests.

According to early work (Ajzen, 1991; Fishbein and Ajzen, 1975), subjective norms represent the social pressure individuals perceive to perform or refrain from a certain action. Previous research has extensively examined the influence of subjective norms on individuals' intentions to adopt new technologies, consistently finding strong support for their influential role in technology acceptance (e.g. Gao *et al.*, 2015; Pelegrin-Borondo *et al.*, 2017; Venkatesh and Bala, 2008). However, Subero-Navarro *et al.* (2022) reported that, in the initial stages of adoption, subjective norms exert a weaker yet still significant influence on shoppers' intentions. These contradictory findings, combined with the understanding that the impact of subjective norms may intensify as a behavior becomes normative (Risselada *et al.*, 2014), underscore the need for further investigation into this relationship.

Altogether, this study posits that individuals' willingness to interact with SR may be significantly influenced by the opinions of those close to them, such as friends and family.

H5. Subjective norms have a positive relationship with the willingness to use SR for making service requests.

The hypothesized model is shown in Figure 1.

3. Methods
3.1 Research design of the survey questionnaire and data
Given the study's empirical focus on predicting Gen Z shoppers' inclination to utilize SR for service requests, a quantitative methodology utilizing the survey research method was
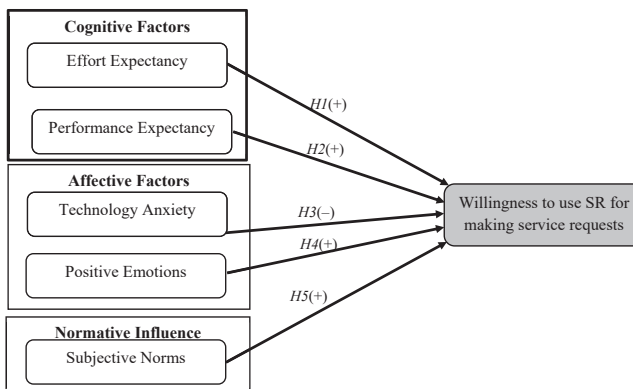
Source(s): Authors' own creation

deemed most appropriate. As part of a broader research endeavor aiming to comprehend SR usage in physical retail settings, this study employed an online questionnaire hosted on Google Cloud to evaluate the proposed model. The questionnaire underwent initial scrutiny by two members of the research team, with subsequent collaborative revisions aimed at enhancing clarity and comprehensibility. Residents of Czechia aged between 18 and 26 years were invited to participate, aligning with established age range criteria for the Gen Z demographic cohort (See also Kim and Kim, 2023; Kymäläinen *et al.*, 2021; Mascia *et al.*, 2022). Participants were encouraged to share the survey within their social networks.

The rationale for focusing on this specific demographic group stems from the recognition that Gen Zs, also referred to as digital natives, represent the future consumers, necessitating urgent analysis of their behaviors across online and offline domains (Romero and Lado, 2021). Both scientific and non-scientific literature widely suggests that Gen Zs exhibit an affinity for emerging technologies such as retail robots, finding them attractive for interaction and service utilization during shopping experiences (cf. Romero and Lado, 2021).

Participation in the study was limited to Czech respondents who patronized prominent retail chains such as Albert, Billa, Kaufland, Lidl, and Tesco. These retail giants, driven by economic and competitive imperatives, are more inclined toward deploying retail robots compared to smaller and lesser-known establishments.

Data collection for this study began in late March and concluded in early October 2022, resulting in a total of 1,115 responses. After careful examination, 170 responses were deemed ineligible as they did not meet the specified inclusion criteria outlined earlier. Therefore, 945 valid responses were included in the analysis. It is crucial to highlight that participation in the study was voluntary, and respondents were not offered any financial incentives apart from a token of gratitude upon completing the survey.

Regarding sample demographics, 55.9% of respondents identified as female, while 40.7% identified as male, and 3.4% preferred not to disclose their gender. In terms of retail preferences, the top five most preferred retail stores among respondents were Albert (30%), Lidl (26%), Tesco (16%), Billa (12%), and Kaufland (10%). Most research respondents (57.5%) reported being familiar with SRs.

3.2 Measurement scale and their underlying sources
All measurements are based on a seven-point scale and adapted from previously validated research to ensure content validity. More specifically, three items are used to measure technology anxiety (i.e. anxiety towards SR) and derived from Tsai *et al.* (2019), a five-item scale from Kim (2021) is used to measure positive emotions. A three-item scale for subjective norms is adapted from Venkatesh and Bala (2008), while the measurement items for effort and performance expectancy scales are adapted from Subero-Navarro *et al.* (2022). Finally, the measurement items for willingness to use SR for making service requests scale are extracted from two previous works (Osakwe *et al.*, 2022; Venkatesh *et al.*, 2012). Further details appear in Appendix.

4. Data analysis and results
Partial least squares structural equation modeling (PLS-SEM) is used as the statistical tool to examine the measurement and structural model. PLS-SEM was chosen for this study owing to its suitability for both exploratory and predictive analyses, consistent with the guidelines recommended by Hair *et al.* (2022).

Moreover, PLS-SEM has been extensively utilized by researchers in the retailing and distribution management domain to study factors influencing the acceptance and usage of emerging technologies (cf. Osakwe *et al.*, 2022). We also acknowledge that compared to

traditional analytical approaches like multiple linear regression (MLR), PLS-SEM yields more robust results, especially considering its robustness to data distributional assumptions as documented in the literature. PLS-SEM is also known to be more efficient than MLR in analyzing relationships between two or more latent variables.

Furthermore, it is worth mentioning that we followed a two-step approach in accordance with SEM-based literature norms. First, the measurement model was tested to assess the validity and reliability of the instruments, following the guidelines of Hair *et al.* (2022) and Ramayah *et al.* (2018). Subsequently, the structural model was examined to test the research hypotheses. The software used for our research analyses was SmartPLS 4 (Ringle *et al.*, 2022).

However, it is crucial to recognize that conventional statistical methods such as covariance-based SEM, PLS-SEM, and MLR alone cannot identify 'must-have-factors' (i.e. necessary factors for willingness to interact with SRs in this context). This limitation led us to incorporate (NCA) to address the limitations of PLS-SEM and complement our research findings.

Meanwhile, data collected from a single source can lead to concerns regarding common method bias (Podsakoff *et al.*, 2024). To mitigate this issue, we adopted both ex-ante and ex-post approaches. Initially, respondents were assured of the voluntary nature of participation and that there were no right or wrong answers. Secondly, it was emphasized that all responses would remain anonymous and treated confidentially. Thirdly, following Kock and Lynn's (2012) recommendations, we tested for full collinearity among variables, with our analysis revealing variance inflation factor (VIF) values below 3.3, indicating the absence of significant single-source bias (cf. Kwarteng *et al.*, 2023; Osakwe *et al.*, 2022). Additionally, Harman's single factor test was conducted, demonstrating that the first factor explained only 34.76% of the total variance, falling below the 50% criterion. Overall, our analyses show no significant common method bias concern.

4.1 Measurement model
For the measurement model, we assessed the loadings, average variance extracted (AVE), and composite reliability (CR). The criteria stipulate that loadings should be ≥ 0.5, AVE should be ≥ 0.5, and CR should be ≥ 0.7. As shown in Table 1, the AVE values exceed 0.5, and the CR values surpass 0.7. Additionally, the loadings are deemed acceptable, with some loadings slightly below 0.708. Given that the AVE is greater than 0.5 and CR is greater than 0.7, they are considered acceptable (Hair *et al.*, 2022).

Discriminant validity is assessed using the HTMT criterion proposed by Henseler *et al.* (2015) and Franke and Sarstedt (2019). According to this criterion, HTMT values should be ≤ 0.85 for conceptually dissimilar constructs and should be ≤ 0.90 for conceptually similar constructs. All the HTMT values are below the stricter criterion of ≤0.85 (Table 1). Therefore,

Variables	CR	AVE	1	2	3	4	5	6
1. Technology Anxiety	0.876	0.704						
2. Effort Expectancy	0.879	0.644	0.362					
3. Performance Expectancy	0.871	0.628	0.129	0.737				
4. Positive Emotions	0.875	0.583	0.094	0.651	0.780			
5. REQ	0.873	0.632	0.197	0.729	0.850	0.836		
6. Subjective Norms	0.745	0.503	0.367	0.401	0.497	0.537	0.516	

Note(s): Willingness to use SR for making service requests abbreviated as REQ. Discriminant validity based on HTMT
Source(s): Authors' own creation

Table 1.
Convergent and discriminant validity of measurement variables

it may be inferred that respondents perceived the six constructs as distinct. Consequently, the measurement items are deemed both valid and reliable.

4.2 Structural model

As recommended by Hair *et al.* (2022) and Cain *et al.* (2017), the multivariate skewness and kurtosis of the data were evaluated. The results indicate that the data deviated from multivariate normality, as evidenced by Mardia's multivariate skewness ($\beta = 2.894$, $p < 0.01$) and Mardia's multivariate kurtosis ($\beta = 62.458$, $p < 0.01$).

Following the guidelines of Hair *et al.* (2022), the path coefficients, standard errors, t-values, and p-values for the structural model were computed using a resample bootstrapping procedure with 5,000 samples (Ramayah *et al.*, 2018). These results are presented in Table 2.

The effects of the five predictors on the willingness to engage with service robots were examined. The R^2 value of 0.604 indicates that the five predictors collectively explained 60.4% of the variance in willingness to use SRs for making service requests in store environments. Effort Expectancy ($\beta = 0.161$, $p < 0.01$), Performance Expectancy ($\beta = 0.327$, $p < 0.01$), Positive Emotions ($\beta = 0.338$, $p < 0.01$), and Subjective Norms ($\beta = 0.093$, $p < 0.01$) exhibited positive relationships with the intention to use SRs for making service requests, while Technology Anxiety ($\beta = -0.083$, $p < 0.01$) demonstrated a negative relationship. Thus, all hypotheses (H1-H5) were supported.

4.3 Necessary Condition Analysis (NCA)

NCA was conducted using SmartPLS 4 to assess the necessity of technology anxiety, effects expectancy, performance expectancy, positive emotions, and subjective norms in relation to shopper intention to use SRs for making service requests at physical stores. It is worth mentioning that we utilize CR-FDH ceiling lines for interpreting effect sizes and accuracy parameters, as recommended for the analysis of continuous variables (Dul, 2016; Dul *et al.*, 2021).

According to the findings, effort expectancy (d = 0.189, accuracy = 99.58%), positive emotions (d = 0.136, accuracy = 99.68%), and performance expectancy (d = 0.102,

Hypothesis	Relationship	Std. Beta	Std. Dev	t-value	p-value	BCI LL	BCI UL	f^2	Decision
H1	Effort Expectancy → REQ	0.161	0.032	5.053	$p < 0.001$	0.110	0.214	0.04	Supported
H2	Performance Expectancy → REQ	0.327	0.036	9.105	$p < 0.001$	0.269	0.386	0.13	Supported
H3	Technology Anxiety → REQ	−0.083	0.024	3.513	$p < 0.001$	−0.120	−0.042	0.02	Supported
H4	Positive Emotions → REQ	0.338	0.037	9.255	$p < 0.001$	0.277	0.399	0.15	Supported
H5	Subjective Norms → REQ	0.093	0.029	3.265	0.001	0.046	0.139	0.02	Supported

Note(s): REQ = willingness to use SR for making service requests; f^2 = effect size
Source(s): Authors' own creation

Table 2.
Hypotheses testing

accuracy = 99.47%) exhibit a medium effect size, while subjective norms demonstrate a small effect size (d = 0.072, accuracy = 99.37%) on intention to use SRs for making service requests (Dul, 2016).

Notably, the NCA revealed a zero effect from technology anxiety to the outcome, indicating that this variable is not deemed a necessary condition for shopper unwillingness to engage with SRs in store environments. Furthermore, the NCA permutation test confirmed that all these effect sizes are statistically significant at $p < 0.001$ (Dul, 2020).

Next, the bottleneck table, as shown in Table 3, exhibits the level of each of the necessary conditions required for achieving a desired level of outcome (in percentage). For example, to achieve a 90% outcome that is, the willingness to use SR for making service requests, the presence of 8.25% of effort expectancy, 18.73% of performance expectancy, 4.97% of positive emotions and 6.35% of subjective norms are necessary. However, at the lower level of usage, i.e. below 10%, none of these factors is found to be necessary.

5. Discussion

The primary objective of this study was to investigate the necessary and sufficient conditions influencing Gen Zs willingness to interact with SRs in retail environments, leveraging the CAN theoretical framework and data collected from a substantial sample of Czech respondents. The study employed PLS-SEM in conjunction with NCA, which offers distinct advantages for theory development and testing by enhancing precision and theoretical clarity, consistent with assertions from prior research (Gigerenzer, 1991; Magno and Cassia, 2024; Richter *et al.*, 2020).

The proposed model in our study accounted for 60.4% of the variance in shoppers' willingness to use SRs for service requests, aligning closely with reported R^2 values in literature utilizing the CAN model (cf. García-Milon *et al.*, 2020, 2021).

Specifically, the study revealed that cognitive factors, specifically effort expectancy and performance expectancy, positively influenced the intention to use SRs (supporting H1 and H2). These findings align with prior research across both retail and non-retail domains (Giovanis *et al.*, 2019; Pelegrín-Borondo *et al.*, 2020; Raza *et al.*, 2017; Subero-Navarro *et al.*, 2022). Notably, performance expectancy significantly boosted shoppers' inclination to interact with SRs, driven by anticipated time savings and enhanced task efficiency during shopping. Similarly, effort expectancy, reflecting perceived ease of use, positively influenced shoppers' intentions to engage with SRs in retail settings.

REQ	ANX	EFE	PEF	PEMO	SNOM
0%	NN	NN	NN	NN	NN
10%	NN	NN	NN	NN	NN
20%	NN	0.32	NN	0.42	NN
30%	NN	0.42	NN	0.42	NN
40%	NN	0.64	NN	0.74	NN
50%	NN	1.27	NN	1.27	NN
60%	NN	1.59	NN	2.01	0.85
70%	NN	2.12	0.52	2.75	1.27
80%	NN	3.70	3.49	3.60	3.49
90%	NN	8.25	18.73	4.97	6.35
100%	NN	12.28	59.05	6.88	13.55

Note(s): NN indicates not necessary
Source(s): Authors' own creation

Table 3.
Bottleneck table

Furthermore, technology anxiety demonstrated a negative relationship with the intention to use SRs for service requests, while positive emotions exhibited a positive relationship (supporting H3 and H4). These results corroborate previous findings in the retail literature highlighting the significant role of emotions in shaping consumers' behaviors (Subero-Navarro *et al.*, 2022). Negative emotions, such as nervousness and discomfort, hindered shoppers' intention to use SRs, whereas positive emotions facilitated willingness to engage with SRs. For example, previous research by Han *et al.* (2007) suggested that consumers tend to avoid choices that might evoke negative emotions. Additionally, studies by Kim (2021) and Subero-Navarro *et al.* (2022) underscored the positive impact of positive emotions on consumers' willingness to use SRs in retail settings. Thus, in our study context, negative emotions like apprehension and discomfort towards SR usage may deter individuals' intention to engage with SRs, while positive emotions can foster willingness.

Moreover, subjective norms positively influenced the intention to utilize SRs for service requests (supporting H5), consistent with previous studies across various contexts (Gao *et al.*, 2015; Pelegrin-Borondo *et al.*, 2017; Venkatesh and Bala, 2008). However, subjective norms demonstrated a comparatively smaller effect size on shoppers' intentions relative to other factors, which is also largely congruent with related research in the retail sector (Subero-Navarro *et al.*, 2022).

Further, building on Richter *et al.* (2020), our interpretations of the findings suggest two key implications. Firstly, higher levels of technology anxiety are anticipated to negatively impact the inclination to use SRs for service requests, without a specific threshold identified. Secondly, increases in both effort expectancy and positive emotions are expected to positively influence willingness to use SRs for service requests, requiring a minimum increase of 1.27% in both factors to achieve a 50% willingness level. Similarly, enhancements in performance expectancy and subjective norms are likely to enhance the intention to use SRs, necessitating at least 0.52% and 1.27% increases, respectively, to attain a 70% outcome level.

Overall, the study contributes valuable insights into Gen Z shoppers' attitudes towards SRs, enriching theoretical understanding and empirical knowledge within the retail context. By employing advanced analytical methods and drawing on robust theoretical foundations, this research lays a solid groundwork for future investigations in the Czech Republic and advances discourse on technology adoption in retail environments.

5.1 Theoretical and methodological contributions

The present study makes a substantial theoretical contribution by endorsing the Cognitive-Affective-Normative (CAN) model as a robust framework for understanding Gen Z shoppers' inclination to interact with SRs in retail environments. Our findings align closely with previous research, affirming the CAN model's relevance in explaining technology adoption behaviors, including SRs (Pelegrín-Borondo *et al.*, 2016, 2017, 2020; Subero-Navarro *et al.*, 2022).

In contrast to Subero-Navarro *et al.* (2022), who found weak evidence regarding effort expectancy's impact on Spanish consumers' intentions to use social robots, our study identifies effort expectancy as not only statistically significant but also a necessary condition for fostering shopper engagement with SRs in stores. Specifically, our PLS-SEM analysis ranks effort expectancy as the third most influential factor influencing Gen Zs willingness to interact with SRs.

Conversely, our findings diverge significantly from studies in other contexts (cf. Lu *et al.*, 2019), which found no significant association between subjective norms—particularly social influence—and the intention to use SRs. However, within the CAN framework, our results resonate with other studies suggesting that subjective norms play pivotal roles in shaping individuals' attitudes towards new technologies (Pelegrín-Borondo *et al.*, 2016, 2017, 2020; García-Milon *et al.*, 2020, 2021).

Significantly, by employing the hybrid approach of PLS-SEM and NCA, the study reveals that subjective norms, positive emotions, and performance expectancy are both necessary and sufficient conditions for Gen Zs willingness to engage with SRs. These findings provide valuable insights for retailers deploying or considering SRs, especially when targeting younger consumer segments.

In summary, our findings provide valuable insights into Gen Z shoppers' receptivity to SRs, enriching both theoretical understanding and empirical contributions within the retail context. This study represents a pioneering effort in using hybrid analytical methods within the CAN framework to uncover essential and independent factors influencing shopper engagement with SRs. By doing so, the study addresses recent calls in the retail literature (Cheung *et al.*, 2022; Duarte *et al.*, 2022; Magno and Cassia, 2024) for the application of rigorous analytical approaches that enhance research comprehension of retail phenomena and improve evidence-based decision-making for retail practitioners in diverse contexts.

5.2 Implications for practice

Through the insights gleaned from PLS-SEM-NCA analyses, retail managers and relevant stakeholders stand to gain valuable insights that can significantly enhance shoppers' engagement with SRs, consequently augmenting their overall shopping experience. Of paramount importance, these findings elucidate the pivotal roles played by positive emotions, subjective norms, as well as effort and performance expectancies in influencing shoppers' interaction with SRs. Armed with the current knowledge, alongside findings from related work (e.g. Alam *et al.*, 2024; Roy *et al.*, 2023; Subero-Navarro *et al.*, 2022), retail managers, in collaboration with robotics manufacturers, can craft targeted marketing strategies aimed at positioning SRs favorably in the minds of young shoppers and potentially other consumer segments.

By leveraging these insights, retailers can maximize their marketing efforts and devise strategies aimed at fostering improved shopper interactions and engagement with SRs within their stores. Crucially, retail management must prioritize factors such as positive emotions, effort, and performance expectancies to ensure the effectiveness of their initiatives. From a practical standpoint, retailers may consider deploying humanoid SRs that are responsive to shoppers' needs and offer a seamless interaction experience akin to human counterparts, thereby fostering meaningful engagement and enthusiasm among shoppers.

In essence, this research serves as a valuable guidance for retail practitioners and robotics manufacturers, offering a deeper understanding of the key factors that drive young shoppers' engagement with SRs. Given the evident enthusiasm among young shoppers, large retail chains contemplating SR deployment should do so without hesitation. These insights provide compelling evidence for the successful integration of SRs into retail settings, thereby justifying investments in this transformative technology.

5.3 Limitations and avenues for further research

This study, while providing valuable insights, also highlights a few limitations that present opportunities for further scholarly exploration. One significant limitation is its exclusive focus on Gen Z shoppers, potentially limiting the generalizability of the findings. Future research could address this by expanding the sample to include diverse consumer segments, thereby enhancing the applicability of the findings across different demographic groups.

Additionally, the study's confinement to the Czech Republic context may limit its applicability to other cultural settings. Consistent with past retail literature (e.g. Giovanis *et al.*, 2019), cross-cultural replication is essential to verify the robustness of the findings in diverse socio-cultural environments.

Furthermore, although the study identifies critical factors influencing shopper engagement with SRs based on the CAN model, it does not comprehensively investigate

underlying mechanisms and moderating variables. Future research should explore these aspects, including potential variations in factors influencing SR usage based on personality traits and demographic variables such as gender and educational background. This line of inquiry would contribute to a deeper understanding of the role of personality traits and demographics in SR usage in retail settings.

Moreover, the study focuses on factors like positive emotions, effort expectancy, and performance expectancy, but overlooks other potentially relevant variables such as self-efficacy and anthropomorphism of robots. Exploring these variables could provide deeper insights into consumers' motivations and barriers to adopting customer-service robots in retail settings.

Lastly, integrating qualitative research methods such as interviews could offer richer insights into consumers' actual motivations and obstacles regarding SR usage. Conducting such qualitative studies across diverse geographies would contribute to a more nuanced understanding of the multifaceted factors influencing the adoption of customer-service robots, thereby enriching scholarly discourse in this emerging field.

6. Conclusion

This paper presents the essential and desirable factors influencing Gen Z shoppers' inclination to engage with customer-service robots in physical retail settings. Notably, our study reveals that while technology anxiety can dissuade shoppers from embracing customer-service robots, it does not emerge as a pivotal necessity for their reluctance to interact with this technology. Furthermore, our findings underscore the significance of cognitive factors such as effort and performance expectancies, as well as affective and normative factors like positive emotions and subjective norms, in fostering shoppers' willingness to engage with customer-service robots. These insights, novel within the realm of service robots in the retail industry, prompt a call to researchers to further explore the synergistic application of PLS-SEM and NCA to corroborate or challenge our findings. Moreover, we urge retail practitioners in the Czech Republic and beyond to leverage these research insights to inform their decision-making and strategic deployment of service robots in physical retail environments.

References

Ajzen, I. (1991), "The theory of planned behavior", *Organizational Behavior and Human Decision Processes*, Vol. 50 No. 2, pp. 179-211.

Alam, S., Abdullah, S., Kokash, H., Ahmed, S. and Omar, N. (2024), "Consumer's acceptance of retail service robots: mediating role of pleasure and arousal", *Journal of Decision Systems*, pp. 1-27, doi: 10.1080/12460125.2024.2318527.

Arora, S., Sahney, S. and Pradhan, D. (2022), "Potential benefits and descriptive norms in webrooming: an extended model of goal-directed behaviour", *International Journal of Retail and Distribution Management*, Vol. 50 No. 3, pp. 377-397, doi: 10.1108/ijrdm-10-2020-0417.

Brengman, M. and Willems, K. (2023), "Robots and AI in retailing and consumer services", *Journal of Retailing and Consumer Services*, Vol. 70, 103177, doi: 10.1016/j.jretconser.2022.103177.

Cain, M.K., Zhang, Z. and Yuan, K.H. (2017), "Univariate and multivariate skewness and kurtosis for measuring nonnormality: prevalence, influence and estimation", *Behavior Research Methods*, Vol. 49 No. 5, pp. 1716-1735, doi: 10.3758/s13428-016-0814-1.

Cheung, M.L., Leung, W.K., Aw, E.C.X. and Koay, K.Y. (2022), "'I follow what you post!': the role of social media influencers' content characteristics in consumers' online brand-related activities (COBRAs)", *Journal of Retailing and Consumer Services*, Vol. 66, 102940, doi: 10.1016/j.jretconser.2022.102940.

Coherent Market Insights (2021), "Retail robots market analysis", *Market Research Report*, available at: https://www.coherentmarketinsights.com/market-insight/retail-robots-market-4535

Duarte, P., Silva, S.C., Linardi, M.A. and Novais, B. (2022), "Understanding the implementation of retail self-service check-out technologies using necessary condition analysis", *International Journal of Retail and Distribution Management*, Vol. 50 No. 13, pp. 140-163, doi: 10.1108/ijrdm-05-2022-0164.

Dul, J. (2016), "Necessary condition analysis (NCA) logic and methodology of 'necessary but not sufficient' causality", *Organizational Research Methods*, Vol. 19 No. 1, pp. 10-52, doi: 10.1177/1094428115584005.

Dul, J. (2020), *Conducting Necessary Condition Analysis*, Sage, London.

Dul, J., Hauff, S. and Tóth, Z. (2021), "Necessary condition analysis in marketing research", in *Handbook of Research Methods for Marketing Management*, Edward Elgar Publishing, pp. 51-72.

Fishbein, M. and Ajzen, I. (1975), *Belief, Attitude, Intention, and Behaviour: An Introduction to Theory and Research*, Addison-Wesley.

Franke, G. and Sarstedt, M. (2019), "Heuristics versus statistics in discriminant validity testing: a comparison of four procedures", *Internet Research*, Vol. 29 No. 3, pp. 430-447, doi: 10.1108/intr-12-2017-0515.

Gao, Y., Li, H. and Luo, Y. (2015), "An empirical study of wearable technology acceptance in healthcare", *Industrial Management and Data Systems*, Vol. 115 No. 9, pp. 1704-1723, doi: 10.1108/imds-03-2015-0087.

García-Milon, A., Juaneda-Ayensa, E., Olarte-Pascual, C. and Pelegrín-Borondo, J. (2020), "Towards the smart tourism destination: key factors in information source use on the tourist shopping journey", *Tourism Management Perspectives*, Vol. 36, 100730, doi: 10.1016/j.tmp.2020.100730.

García-Milon, A., Pelegrín-Borondo, J., Juaneda-Ayensa, E. and Olarte-Pascual, C. (2021), "The smartphone: the tourist's on-site shopping friend. An extended cognitive, affective, normative model", *Telematics and Informatics*, Vol. 61, 101618, doi: 10.1016/j.tele.2021.101618.

Gauquier, L.D., Brengman, M., Willems, K., Cao, H.L. and Vanderborght, B. (2021), "In or out? A field observational study on the placement of entertaining robots in retailing", *International Journal of Retail and Distribution Management*, Vol. 49 No. 7, pp. 846-874, doi: 10.1108/ijrdm-10-2020-0413.

Gigerenzer, G. (1991), "From tools to theories: a heuristic of discovery in cognitive psychology", *Psychological Review*, Vol. 98 No. 2, pp. 254-267, doi: 10.1037//0033-295x.98.2.254.

Giovanis, A., Assimakopoulos, C. and Sarmaniotis, C. (2019), "Adoption of mobile self-service retail banking technologies: the role of technology, social, channel and personal factors", *International Journal of Retail and Distribution Management*, Vol. 47 No. 9, pp. 894-914, doi: 10.1108/ijrdm-05-2018-0089.

Hair, J.F., Hult, G.T.M., Ringle, C.M. and Sarstedt, M. (2022), *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*, Sage, Thousand Oaks, CA.

Han, S., Lerner, J.S. and Keltner, D. (2007), "Feeling and consumer decision making: the appraisal-tendency framework", *Journal of Consumer Psychology*, Vol. 17 No. 3, pp. 158-168.

Henseler, J., Ringle, C. and Sarstedt, M. (2015), "A new criterion for assessing discriminant validity in variance-based structural equation modeling", *Journal of the Academy of Marketing Science*, Vol. 43 No. 1, pp. 115-135, doi: 10.1007/s11747-014-0403-8.

Kim, J.H. (2021), "Service authenticity and its effect on positive emotions", *Journal of Services Marketing*, Vol. 35 No. 5, pp. 572-584.

Kim, D.Y. and Kim, H.-Y. (2023), "Social media influencers as human brands: an interactive marketing perspective", *Journal of Research in Interactive Marketing*, Vol. 17 No. 1, pp. 94-109.

Kock, N. and Lynn, G.S. (2012), "Lateral collinearity and misleading results in variance-based SEM: an illustration and recommendations", *Journal of the Association for Information Systems*, Vol. 13 No. 7, pp. 546-580, doi: 10.17705/1jais.00302.

Kwarteng, M.A., Ntsiful, A., Osakwe, C.N., Jibril, A.B. and Chovancova, M. (2023), "Cultural influences on future transportation technology usage: the role of personal innovativeness, technology anxiety and desire", *International Journal of Consumer Studies*, Vol. 47 No. 2, pp. 629-651, doi: 10.1111/ijcs.12854.

Kymäläinen, T., Seisto, A. and Malila, R. (2021), "Generation Z food waste, diet and consumption habits: a Finnish social design study with future consumers", *Sustainability*, Vol. 13 No. 4, p. 2124, doi: 10.3390/su13042124.

Lu, L., Cai, R. and Gursoy, D. (2019), "Developing and validating a service robot integration willingness scale", *International Journal of Hospitality Management*, Vol. 80, pp. 36-51.

Lyu, J., Hahn, K. and Lee, H.J. (2023), "Potential determinants of consumers' intention to purchase 3D printed fashion products", *International Journal of Retail and Distribution Management*, Vol. 51 No. 8, pp. 1027-1044, doi: 10.1108/ijrdm-09-2021-0437.

Ma, C., Chen, P.-J., Ren, L., Fan, A. and Ongsakul, V. (2023), "A projective approach to understanding the Generation Z's experience with service robots in restaurants", *Journal of Hospitality and Tourism Technology*, Vol. 14 No. 5, pp. 717-731, doi: 10.1108/jhtt-01-2022-0020.

Magno, F. and Cassia, F. (2024), "Predicting restaurants' surplus food platform continuance: insights from the combined use of PLS-SEM and NCA and predictive model comparisons", *Journal of Retailing and Consumer Services*, Vol. 79, 103820, doi: 10.1016/j.jretconser.2024.103820.

Mascia, M.L., Bonfiglio, N.S., Renati, R., Cataudella, S., Tomczyk, L. and Penna, M. (2022), "Problematic smartphone use and cognitive failures: an explorative study among three different generations (X, Y, Z)", *19th International Conference on Cognition and Exploratory Learning in Digital Age (CELDA 2022)*, IADIS, Lisbon, pp. 233-240.

Noble, S.M., Mende, M., Grewal, D. and Parasuraman, A. (2022), "The Fifth Industrial Revolution: how harmonious human–machine collaboration is triggering a retail and service [r] evolution", *Journal of Retailing*, Vol. 98 No. 2, pp. 199-208, doi: 10.1016/j.jretai.2022.04.003.

Osakwe, C.N., Hudik, M., Ríha, D., Stros, M. and Ramayah, T. (2022), "Critical factors characterizing consumers' intentions to use drones for last-mile delivery: does delivery risk matter?", *Journal of Retailing and Consumer Services*, Vol. 65, 102865, doi: 10.1016/j.jretconser.2021.102865.

Park, S.S., Tung, C.D. and Lee, H. (2021), "The adoption of AI service robots: a comparison between credence and experience service settings", *Psychology and Marketing*, Vol. 38 No. 4, pp. 691-703, doi: 10.1002/mar.21468.

Pelegrin-Borondo, J., Reinares-Lara, E. and Olarte-Pascual, C. (2017), "Assessing the acceptance of technological implants (the cyborg): evidences and challenges", *Computers in Human Behavior*, Vol. 70, pp. 104-112, doi: 10.1016/j.chb.2016.12.063.

Pelegrín-Borondo, J., Araújo-Vila, N. and Fraiz-Brea, J. (2020), "Comparison of spa choice between wellness tourists and healthcare/medical tourists", *Healthcare*, Vol. 8 No. 4, p. 544, doi: 10.3390/healthcare8040544.

Pelegrin-Borondo, J., Arias-Oliva, M., Almahameed, A.A. and Román, M.P. (2021), "Covid-19 vaccines: a model of acceptance behavior in the healthcare sector", *European Research on Management and Business Economics*, Vol. 27 No. 3, pp. 100-171, doi: 10.1016/j.iedeen.2021.100171.

Pelegrín-Borondo, J., Reinares-Lara, E., Olarte-Pascual, C. and Garcia-Sierra, M. (2016), "Assessing the moderating effect of the end user in consumer behavior: the acceptance of technological implants to increase innate human capacities", *Frontiers in Psychology*, Vol. 7 No. 132, pp. 1-13.

Pew Research Center (2019), "Defining generations: where Millennials end and Generation Z begins", available at: https://www.pewresearch.org/short-reads/2019/01/17/where-millennials-end-and-generation-z-begins/

Podsakoff, P.M., Podsakoff, N.P., Williams, L.J., Huang, C. and Yang, J. (2024), "'Common method bias: it's bad, it's complex, it's widespread, and it's not easy to fix", *Annual Review of Organizational*

Psychology and Organizational Behavior, Vol. 11 No. 1, pp. 17-61, doi: 10.1146/annurev-orgpsych-110721-040030.

Ramayah, T., Cheah, J., Chuah, F., Ting, H. and Memon, M.A. (2018), *Partial Least Squares Structural Equation Modeling (PLS-SEM) Using Smartpls 3.0: An Updated Guide and Practical Guide to Statistical Analysis*, 2nd ed., Pearson, Kuala Lumpur.

Raza, S.A., Umer, A. and Shah, N. (2017), "New determinants of ease of use and perceived usefulness for mobile banking adoption", *International Journal of Electronic Customer Relationship Management*, Vol. 11 No. 1, pp. 44-65, doi: 10.1504/ijecrm.2017.10007744.

Richter, N.F., Schubring, S., Hauff, S., Ringle, C.M. and Sarstedt, M. (2020), "When predictors of outcomes are necessary: guidelines for the combined use of PLS-SEM and NCA", *Industrial Management and Data Systems*, Vol. 120 No. 12, pp. 2243-2267, doi: 10.1108/imds-11-2019-0638.

Ringle, C.M., Wende, S. and Becker, J.M. (2022), *SmartPLS 4*, SmartPLS GmbH, Oststeinbek, p. 11.

Risselada, H., Verhoef, P.C. and Bijmolt, T.H.A. (2014), "Dynamic effects of social influence and direct marketing on adoption of high-technology products", *Journal of Marketing*, Vol. 78 No. 2, pp. 52-68, doi: 10.1509/jm.11.0592.

Romero, J. and Lado, N. (2021), "Service robots and COVID-19: exploring perceptions of prevention efficacy at hotels in generation Z", *International Journal of Contemporary Hospitality Management*, Vol. 33 No. 11, pp. 4057-4078, doi: 10.1108/ijchm-10-2020-1214.

Roozen, I., Raedts, M. and Yanycheva, A. (2023), "Are retail customers ready for service robot assistants?", *International Journal of Social Robotics*, Vol. 15 No. 1, pp. 15-25, doi: 10.1007/s12369-022-00949-z.

Roy, S.K., Singh, G., Gruner, R.L., Dey, B.L., Shabnam, S., Muhammad, S.S. and Quaddus, M. (2023), "Relationship quality in customer-service robot interactions in Industry 5.0: an analysis of value recipes", *Information Systems Frontiers*, pp. 1-20, doi: 10.1007/s10796-023-10445-y.

Song, C.S. and Kim, Y.K. (2022), "The role of the human-robot interaction in consumers' acceptance of humanoid retail service robots", *Journal of Business Research*, Vol. 146, pp. 489-503, doi: 10.1016/j.jbusres.2022.03.087.

Song, C.S., Kim, Y.K., Jo, B.W. and Park, S.H. (2022), "Trust in humanoid robots in footwear stores: a large-N crisp-set qualitative comparative analysis (csQCA) model", *Journal of Business Research*, Vol. 152, pp. 251-264, doi: 10.1016/j.jbusres.2022.07.012.

Subero-Navarro, A., Pelegrín-Borondo, J., Reinares-Lara, E. and Olarte-Pascual, C. (2022), "Proposal for modeling social robot acceptance by retail customers: CAN model+ technophobia", *Journal of Retailing and Consumer Services*, Vol. 64, 102813, doi: 10.1016/j.jretconser.2021.102813.

Tsai, J.M., Cheng, M.J., Tsai, H.H., Hung, S.W. and Chen, Y.L. (2019), "Acceptance and resistance of telehealth: the perspective of dual-factor concepts in technology adoption", *International Journal of Information Management*, Vol. 49, pp. 34-44, doi: 10.1016/j.ijinfomgt.2019.03.003.

Venkatesh, V. and Bala, H. (2008), "Technology acceptance model 3 and a research agenda on interventions", *Decision sciences*, Vol. 39 No. 2, pp. 273-315.

Venkatesh, V., Morris, M.G., Davis, G.B. and Davis, F.D. (2003), "User acceptance of information technology: toward a unified view", *MIS Quarterly*, Vol. 27 No. 3, pp. 425-478, doi: 10.2307/30036540.

Venkatesh, V., Thong, J.Y. and Xu, X. (2012), "Consumer acceptance and use of information technology: extending the unified theory of acceptance and use of technology", *MIS Quarterly*, Vol. 36 No. 1, pp. 157-178, doi: 10.2307/41410412.

Further reading

Davis, F.D., Bagozzi, R.P. and Warshaw, P.R. (1989), "User acceptance of computer technology: a comparison of two theoretical models", *Management Science*, Vol. 35 No. 8, pp. 982-1003, doi: 10.1287/mnsc.35.8.982.

Hult, G.T.M., Hair, J.F., Proksch, D., Sarstedt, M., Pinkwart, A. and Ringle, C.M. (2018), "Addressing endogeneity in international marketing applications of partial least squares structural equation modelling", *Journal of International Marketing*, Vol. 26 No. 3, pp. 1-21, doi: 10.1509/jim.17.0151.

Shmueli, G., Sarstedt, M., Hair, J.F., Cheah, J.H., Ting, H., Vaithilingam, S. and Ringle, C.M. (2019), "Predictive model assessment in PLS-SEM: guidelines for using PLSpredict", *European Journal of Marketing*, Vol. 53 No. 11, pp. 2322-2347, doi: 10.1108/ejm-02-2019-0189.

Appendix

Latent variables	Measurement items	Literature sources
Technology anxiety (i.e. anxiety towards service robots)	I will be scared to use service robots for making requests at the store I will feel nervous about using service robot while making requests in the store In general, I will feel uncomfortable interacting with a service robot at the store	Tsai *et al.* (2019
Positive emotions	Using a robot for making service requests at the store will be enjoyable It will be a pleasurable experience for me to use service robots for making requests in the store I will be happy to ask for assistance from a service robot while shopping I believe it will be fun to use service robots while making requests at the store Overall, using service robots in the store for request making will be satisfying	Kim (2021)
Subjective norms	People who are close to me may influence my decision to use service robots for request making at stores For me asking for assistance from service robots while shopping will depend on the opinions of those whom I value My family and friends would support the idea of using service robots for request making at the store	Venkatesh and Bala (2008)
Effort expectancy	It will be easy for me to learn to use service robots for making requests in the store Using service robots for request making in the store will be clear and understandable for me It will be easy for me to use service robots for making requests while shopping It will be easy for me to become proficient in using service robots for request making in the store	Subero-Navarro *et al.* (2022)
Performance expectancy	Using a service robot at the store to make requests will be useful to me Using a service robot for making requests at the store will increase my chances of achieving my shopping goals Using service robots for making requests will allow me to shop faster Using service robots for request making at the store will help me shop more productively	Subero-Navarro *et al.* (2022)
Willingness to use SR for making service requests	I predict I will use service robots for making requests at the store If available, there is a strong chance that I will ask for assistance from a service robot during my visit to the store I could see myself using a service robot to make requests at the store Using a service robot to make request at the store is something I would do	Osakwe *et al.* (2022), Venkatesh *et al.* (2012)

Source(s): Authors' own creation

Table A1.
Measurement items underpinning the latent variables

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