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USERS' ATTITUDES TOWARDS SELF-SERVICE TECHNOLOGIES (SSTs): THE ROLE OF DEMOGRAPHIC FACTORS

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Abstract

In the contemporary business environment, many companies in Central and Eastern Europe (CEE) have adopted self-service technologies (SSTs), moving away from traditional face-to-face interactions. Although numerous studies have examined the factors that shape users' attitudes towards SSTs, the extant literature has primarily focused on the impact of specific individual and technological factors. In addition, a predominant emphasis is placed on SSTs for hotels, restaurants and retail stores. To bridge these gaps, the present research explores the effect of demographic factors on Bulgarian users' attitudes towards SSTs at filling stations. The methodology employed consists of a review of the existing literature on SST-related attitudes and a quantitative analysis, for which data were collected via a web-based self-administered questionnaire. Results reveal that younger individuals attribute higher convenience to SSTs than persons of older age. Unexpectedly, advanced age is associated with lower SST anxiety and heightened SST readiness. Additionally, females demonstrate greater SST apprehension and reduced SST readiness compared to males. Notably, education plays a role as well, suggesting that individuals with a Bachelor's degree exhibit escalated SST anxiety and diminished SST readiness in comparison to those with secondary education. The originality of this paper lies in the fact that it attempts to add substantial new knowledge to understanding the interplay between demographic variables and selected individual and technological factors. By virtue of this, the present study highlights another important dimension in the process of designing and implementing SSTs – shaping user experiences that cater to demographic differences so that user acceptance can be reinforced. **Implications for Central European audience**: From a social perspective, this study offers valuable insights for the development of user-centric self-service solutions. By gaining comprehension of users' attitudes towards SSTs, technology providers can tailor their offerings to meet diverse user preferences, thus allowing the enhancement of user experiences and promotion of wider SST acceptance. In an economic context, the research allows filling stations to make informed decisions regarding the integration of such solutions, potentially leading to operational cost reduction and improved service efficiency. This could translate into lower consumer prices/higher profits.

Keywords: Attitudes; self-service solutions; self-service technologies
JEL Classification: M3, M15, M39

Introduction

Adequate service provision is a critical aspect of differentiation for many modern-day organisations. Furthermore, suitable technologies create multiple business opportunities that can generate new revenue streams by perpetuating a cycle of implementation of new technological developments. The business world witnesses the intricate challenge of designing an entire experience whereby customers feel empowered enough to substitute their regular company-customer interactions with self-administered services. More precisely, intelligent solutions offer increasing opportunities to replace human interactions with SSTs. However, previous studies offer predominantly generalizable insights into individual and technological factors across a limited set of industries as related to the implementation and usage of self-service solutions. There has been little research into demographic variables influencing SST adoption and usage intentions. The most recent studies in the field cover particular technological benefits (e.g., data analytics, business intelligence), usability issues, key success factors and implications for people with disabilities. In this context, it is imperative to also address the role of demographic variables on attitudes, as the latter could serve as powerful devices for marketers and engineers.

In recent years, there has been a notable shift towards technology-based interactions across various industries, which has significantly affected business-customer dynamics (Olujimi & Ade-Ibijola, 2023; Klier et al., 2016). Companies are increasingly complementing or replacing traditional service delivery encounters with SSTs (Chang et al., 2016; Robertson et al., 2016), thereby enabling customers to access and utilise services independently (Nijssen et al., 2016). Fundamentally, self-service solutions offer businesses the opportunity to ensure more consistent service quality and achieve cost reductions, primarily by lowering labour expenses (Curran & Meuter, 2005; Wang et al., 2012). What is more, these technologies facilitate expedited service provision and allow customers to access services free of temporal and spatial constraints. Consequently, SST adoption is a cost-saving move that enhances customer value (Scherer et al., 2015). Nonetheless, the integration of SSTs entails inherent risks due to user challenges that might arise (Klier et al., 2016). Should the transition to such solutions encounter obstacles, it could result in a complicated user experience, which could potentially lead to overall reluctance to the utilisation of SSTs (Chang et al., 2016). Given the significant time and financial investments required for SST implementation, it is crucial to understand users' attitudes and adoption intentions when integrating such solutions (Meuter et al., 2005). Acknowledging this, numerous studies have investigated the factors shaping users' SST-related attitudes and adoption intentions (Meuter et al., 2005; Cunningham et al., 2008). These works reveal that such technologies elicit varied responses among users, some of whom value their flexibility and expediency, while others deem them as impeding transactional processes and engendering feelings of apprehension (Collier et al., 2014).

It is worth mentioning that while SSTs have been widely studied, a large body of literature focuses on self-service solutions for hotels, restaurants and retail stores (Weijters et al., 2007; Oh et al., 2013). This study accentuates the relatively unexplored category of SSTs intended

for filling stations, responding to the need for research into specific service contexts (Curran & Meuter, 2005; Wang et al., 2012).

Lastly, the majority of studies focus on the influence of particular individual and technological factors on SST-related attitudes and usage intentions (Walker et al., 2002; Lee et al., 2010; Oh et al., 2013; Grewal et al., 2020), with limited research evaluating the effect of demographic variables (Meuter et al., 2005; Lee et al., 2010). Consequently, this study seeks to examine the impact of age, gender and education on attitudes and adoption intentions concerning self-service solutions through selected individual (technology anxiety, technology readiness and desire for personal interaction) and technological factors (perceived convenience and perceived reliability). The results hold important social and economic implications. From a social perspective, through the exploration of Bulgarian users' attitudes towards SSTs at filling stations, this research has the potential to unveil the underlying factors that influence these attitudes. Thus, valuable insights can be provided for the development of user-centric self-service solutions that cater to the diverse preferences and needs of individuals. From an economic standpoint, gaining an understanding of the factors that shape Bulgarian users' attitudes towards SSTs could empower filling stations to make informed decisions regarding the integration of self-service solutions within their operations.

1 Conceptual Underpinnings

1.1 Attitudes: definition, conceptualisation and measurement

Throughout the years, the term "attitude" has been extensively utilised in numerous studies exploring consumer behaviour within different contexts. Given its influence on individuals' reactions to specific objects or events, the notion of attitude is essential within the purview of psychological and behavioural research. Esteemed scholars in this academic landscape, including Allport (1935), Campbell, Doob (1947), Fishbein and Ajzen (1975) and Thurstone (1928), have drawn notable attention to the concept. This has led to the emergence of various definitions, with some of the most distinguished ones being summarised in Table 1.

Table 1 | Definitions of the term "attitude"

Author(s)	Year	Definition
Thurstone	1928	An amalgamation of an individual's inclinations and emotions, partialities and predispositions, thoughts, beliefs, apprehension and unease regarding a given subject
Allport	1935	A cognitive and neural condition of preparedness, shaped by past experiences, which has an impact on a person's reactions to all associated objects and situations
Doob	1947	An inherent, motivation-driven reaction that is induced by different stimulus patterns as a consequence of prior learning or generalisation gradients and discrimination and is deemed socially significant within the societal context of the individual
Smith et al.	1956	An individual's tendency to experience, be motivated by and act towards a particular object in a specific manner, with characteristic affect
Rokeach	1968	An organised set of beliefs that are relatively long-lasting and predispose an individual towards reacting in a specific manner to a given object or situation
Fishbein and Ajzen	1975	A person's predisposition to have a consistent positive or negative reaction towards a psychological entity
Fazio and Williams	1986	A person's evaluations of an object or event, assisting them in the organisation and comprehension of their intricate social surroundings
Hoyer and MacInnis	1997	A person's comprehensive and lasting assessment of an object, topic or action
Altmann	2008	A condition of holding beliefs, attaching value or experiencing emotions that incline a person towards a particular action or behaviour
Myers and Twenge	2013	An individual's positive or negative response to a given object, expressed through their beliefs, emotions and planned behaviour

Source: Authors' table based on the literature reviewed (2023)

As observed in the table, only two of the ten definitions encompass all three dimensions (cognitive, affective and behavioural) intrinsic to the attitude concept. On the one hand, Altmann (2008) elucidated the term as an individual's propensity to act towards a specific object, influenced by their beliefs and emotions. Nevertheless, Altmann's definition lacks precision regarding the inherent nature of attitudes, which could be straightforward (positive or negative, favourable or unfavourable) or more intricate and ambivalent (both positive and negative or both favourable and unfavourable). In contrast, Myers and Twenge (2013) provided a more detailed elucidation, describing the concept as an individual's positive or negative reaction to an object, expressed through their beliefs, emotions and behaviour. This meaning is hereby adopted as a working definition in this research and is used as a guiding principle for designing the conceptual model of the study.

Particularly, the varied interpretations of the concept of attitude have resulted in a proliferation of diverse explanatory approaches, each characterised by unique perspectives and underlying assumptions. Among these, two principal orientations stand out: the behaviourist and mentalist approaches. While the mentalist orientation presumes individuals' rationality, endowing them with reasoning, adaptability and self-critique, the behaviourist approach posits

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that people are irrational with low reasoning abilities. Given this consideration and recognising that the majority of models within the mentalist orientation incorporate more aspects of the attitude-behaviour continuum than those within the behaviourist approach, this study adheres to the mentalist perspective, viewing attitudes as complex constructs comprising cognitive, affective and behavioural components. In addition, the above-stated components are integral to the formulation of the research hypotheses.

When concerning the measurement of attitudes, a considerable array of methods have emerged over the years. As outlined by Cook and Selltiz (1964), these methods can be classified into five categories: (1) direct questioning or self-report techniques; (2) observation of a respondent's behaviour in a natural setting; (3) examination of an individual's responses to partially structured stimuli; (4) assessment of one's performance on objective tasks; and (5) analysis of a person's physiological reactions to specific objects. Among these, self-reports are primarily used, with the techniques of Thurstone (1928), Likert (1932), Guttman (1947) and Osgood et al. (1957) being particularly preferred. Specifically, the Likert and semantic differential scales are favoured due to their ease of construction and simplicity for respondents. Additionally, not only is the Likert scale especially advantageous for the efficient collection of data from large samples in terms of time and costs, but it also demonstrates a higher reliability coefficient (0.95) compared to the semantic differential method (0.86) (Tittle & Hill, 1967), which explains its enduring popularity among researchers (Poppleton & Pilkington, 1964). Hence, the present research works with Likert-type questions. Yet, attitudes need to be interpreted in the specific setting, which requires exploration of the classifications of SSTs.

1.2 SSTs: definition, classification, advantages and disadvantages

In contrast to the diverse interpretations of the attitude concept that have emerged over time, only three definitions of the term "SSTs" have been formulated (Table 2).

Table 2 | Definitions of the term "SSTs"

Author(s)	Year	Definition
Dabholkar	1994	Technology-based advantages or activities that users can perform on their own
Meuter et al.	2000	Technological interfaces via which users can produce services themselves without the need for personnel to be directly involved in the process
Hilton and Hughes	2012	Firm-supplied technologies with the purpose of allowing users to adopt self-service behaviour

Source: Authors' table based on the literature reviewed (2023)

Upon reviewing the definitions in the table, it is evident that Meuter et al. (2000) provided the most comprehensive explanation of the SST concept. Therefore, self-service solutions are henceforth interpreted in terms of this particular definition, which is incorporated in the formulation of the research hypotheses.

As the study of SSTs progressed, scholars recognised the need for a classification system to categorise different self-service solutions. As a result, scholars such as Bitner et al. (2000),

Dabholkar and Bagozzi (2002), Cunningham et al. (2008) and Collier et al. (2014) developed multiple systems. Among these, the classification of Bitner et al. (2000) is considered the most detailed since it differentiates SSTs along two dimensions – interface (telephone-based technologies and interactive voice response systems, online connections and internet-based interfaces, interactive kiosks and video or compact disc technologies) and purpose (customer service, transactions and self-help). Consequently, the system devised by Bitner et al. (2000) is employed for the purposes of this study.

Over time, self-service solutions have demonstrated intrinsic benefits for both businesses and end-users. On the one hand, such technologies offer users significant time and cost savings, along with greater control over the service delivery process (Bitner et al., 2000; Curran & Meuter, 2005). Often, SSTs are distinguished by their efficiency, temporal and spatial convenience, flexibility and ease of use (Bitner et al., 2000). However, universal adoption of these technologies is not guaranteed, as their introduction does not automatically ensure user acceptance (Liljander et al., 2006). Consequently, businesses must assess individuals' attitudes towards self-service solutions to determine whether they are perceived positively or as a detriment to the overall service experience (Curran et al., 2003) and should take into account that users are less likely to engage with SSTs if they consider them inconvenient or causing discomfort (Meuter et al., 2005).

On the other hand, a growing number of businesses have been integrating self-service solutions either as supplements or replacements for their traditional services (Wang et al., 2012). This strategic adoption is aimed at enhancing profitability by capitalising on SST benefits, such as cost efficiencies, improved productivity, greater service consistency through reduced employee involvement, and extended service availability (Curran et al., 2003). The implementation of such technologies offers companies the opportunity to expand their outreach and provide services that are more flexible (Bitner et al., 2000). Nonetheless, SST introduction entails inherent risks as it requires substantial time and capital investments (Chang et al., 2016). Moreover, the success of such integration is heavily reliant on users' attitudes, as SSTs can evoke apprehension among the less technologically savvy, potentially jeopardising their relationship with the service provider (Nijssen et al., 2016).

After considering the advantages and disadvantages of SSTs, it should be noted that this study aims to investigate users' attitudes towards such solutions, thereby adopting a user-centric perspective to accomplish the defined research objectives.

1.3 Attitudes towards SSTs – determinants of SST utilisation and technology adoption theories

Throughout the years, understanding users' attitudes and adoption intentions concerning SSTs has attracted significant research interest (Dabholkar, 1996; Meuter et al., 2005; Oh et al., 2013; Ongena et al., 2020). As a result, different determinants of these attitudes and intentions have been identified, falling into three main categories: technological, individual and situational factors. Unsurprisingly, the heightened research interest in users' technology-related attitudes and usage intentions has led to the adoption of several technology acceptance models, including the diffusion of innovation theory (IDT) (Rogers, 1983), the technology acceptance model (TAM) 1, 2 and 3 (Davis, 1986; Venkatesh & Davis, 2000; Venkatesh & Bala, 2008), the attribute-based model (ABM) (Dabholkar, 1996) and the unified theory of acceptance and use of technology (UTAUT) 1 and 2 (Venkatesh et al., 2003;

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Venkatesh et al., 2012). Among these frameworks, TAM 3 (Venkatesh & Bala, 2008) and UTAUT 2 (Venkatesh et al., 2012) are considered to provide a comprehensive depiction of the factors influencing attitudes and utilisation intentions regarding SSTs. However, although both models place a focal emphasis on situational factors, alongside certain individual and technological factors, only UTAUT 2 takes into account the moderating effect of age and gender. Consequently, the conceptual framework of this study is built upon UTAUT 2.

Despite the substantial body of literature on self-service solutions, notable gaps remain. The vast majority of the studies predominantly examine the influence of specific individual and technological factors on users' attitudes and usage intentions, as well as their relationships (Walker et al., 2002; Lee et al., 2010; Oh et al., 2013). Evidently, situational factors and demographic variables are less frequently assessed, with limited research exploring their significance (Dabholkar, 1996; Meuter et al., 2005; Weijters et al., 2007; Lee et al., 2010). Also, a considerable part of the research focuses on SSTs for restaurants, hotels and retail stores (Dabholkar, 1996; Weijters et al., 2007; Oh et al., 2013) and there is a lack of literature on self-service solutions intended for filling stations.

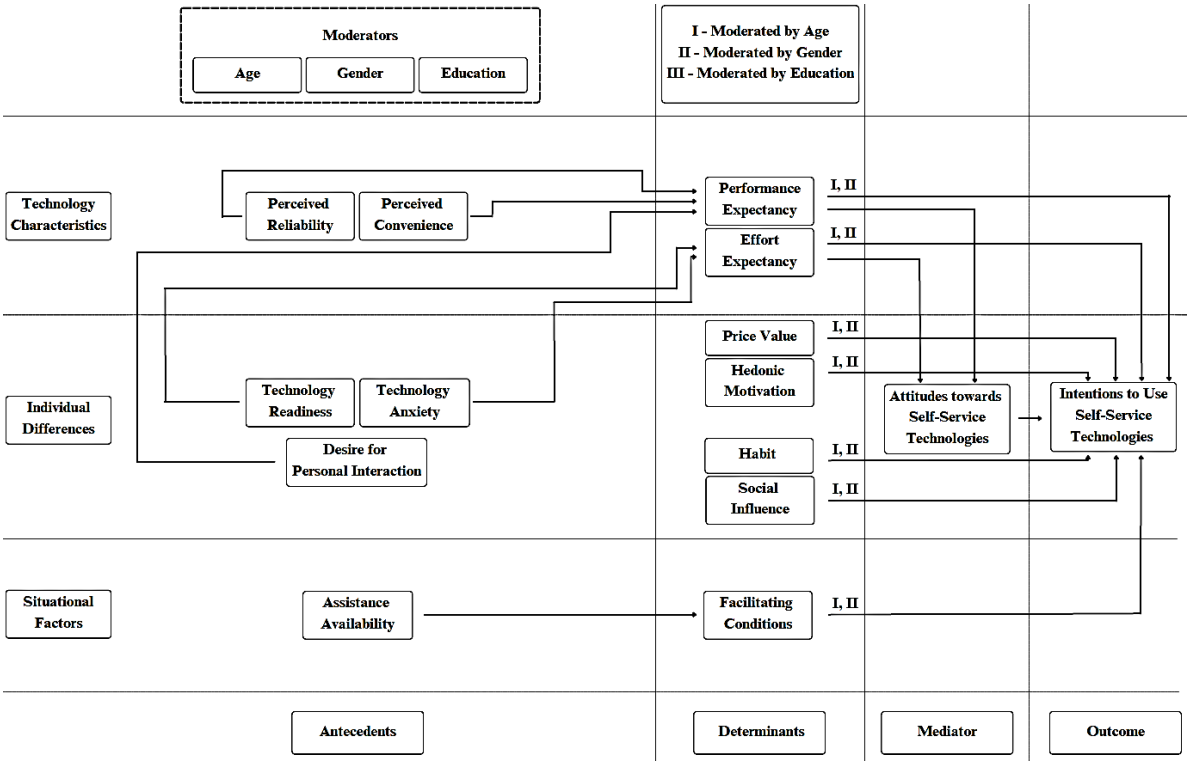
To address these gaps, this study investigates users' attitudes towards SSTs at filling stations. More precisely, it examines how certain demographic variables – age, gender, education – affect attitudes and adoption intentions concerning such solutions through selected individual (technology anxiety, technology readiness and desire for personal interaction) and technological factors (perceived convenience and perceived reliability).

2 Research Methodology

2.1 Conceptual model and hypotheses

Given the predominant emphasis on specific individual and technological factors in previous research, there is a need for a conceptual model encompassing all three categories of factors influencing SST-related attitudes and utilisation intentions. To address this, a conceptual framework is devised for the purpose of extending UTAUT 2 (Venkatesh et al., 2012), acknowledged as the soundest and most comprehensive technology adoption model (Tamilmani et al., 2021). This framework comprises seven fundamental constructs, denoted as determinants: performance expectancy, effort expectancy, facilitating conditions, social influence, hedonic motivation, habit and price value. Attitudes act as a mediator between each of the seven core constructs and usage intentions, as proposed by TAM 1 (Davis, 1986).

Figure 1 | Conceptual model



Source: Authors' figure based on the literature reviewed (2023)

It is important to note that the concept of performance expectancy within UTAUT 2 corresponds to relative advantage within IDT (Rogers, 1983), extrinsic motivation within the self-determination theory (SDT) (Deci & Ryan, 1985) and perceived usefulness within TAM 1, 2 and 3 (Davis, 1986; Venkatesh & Davis, 2000; Venkatesh & Bala, 2008). In the present conceptual framework, performance expectancy is depicted as a core construct influenced by three antecedents: desire for personal interaction, perceived reliability and perceived convenience. Additionally, the concept of effort expectancy within UTAUT 2 aligns with complexity within IDT (Rogers, 1983) and perceived ease of use within TAM 1, 2 and 3 (Davis, 1986; Venkatesh & Davis, 2000; Venkatesh & Bala, 2008). In the present conceptual model, effort expectancy is considered a core construct affected by two antecedents: technology anxiety and technology readiness. Furthermore, both performance and effort expectancies are posited to affect SST-related attitudes and adoption intentions.

When discussing facilitating conditions, it is essential to acknowledge their conceptual alignment with compatibility within IDT (Rogers, 1983). In the present conceptual framework, they are presented as a core construct influenced by one antecedent: assistance availability. The inclusion of this factor stems from the acknowledgement that the absence of on-site assistance might hinder individuals' willingness to engage with unfamiliar technologies

(Nanayakkara, 2007). Hence, in the present conceptual model, facilitating conditions are portrayed as directly affecting users' intentions to use SSTs.

It is pertinent to mention that the concept of social influence within UTAUT 2 corresponds to image and subjective norms within TAM 2 and 3 (Venkatesh & Davis, 2000; Venkatesh & Bala, 2008). In addition, the concept of hedonic motivation aligns with enjoyment within ABM (Dabholkar, 1996) and perceived enjoyment within TAM 3 (Venkatesh & Bala, 2008). Unlike the performance and effort expectancy constructs, however, social influence, hedonic motivation, price value and habit within the present conceptual framework are depicted as fundamental constructs with no antecedents, directly affecting users' SST adoption intentions.

Lastly, as per UTAUT 2, age and gender moderate the relationships between each core construct and SST usage intentions. Similarly, the moderating effect of experience applies to all relationships except those between performance expectancy and intentions and between price value and intentions. In the present model, the experience factor is excluded, while education is introduced as an additional moderator. This inclusion is justified by the influence of education on users' evaluation of specific self-service solution attributes (Weijters et al., 2007).

It is essential to acknowledge that this research examines whether age, gender and education indirectly affect attitudes towards SSTs through perceived convenience, perceived reliability, technology anxiety, technology readiness and the desire for personal interaction. Given the aim and scope of the study, fifteen hypotheses are formulated:

- **H1**: Users' perceptions of SSTs as reliable are affected by their age.
- **H2**: Users' perceptions of SSTs as convenient are affected by their age.
- **H3**: Users' desire for personal interaction is influenced by their age.
- **H4**: Technology anxiety associated with SST use is affected by users' age.
- **H5**: Technology readiness associated with SST utilisation is affected by users' age.
- **H6**: Users' perceptions of SSTs as reliable are affected by their gender.
- **H7**: Users' perceptions of SSTs as convenient are affected by their gender.
- **H8**: Users' desire for personal interaction is influenced by their gender.
- **H9**: Technology anxiety associated with SST use is affected by users' gender.
- **H10**: Technology readiness associated with SST utilisation is affected by users' gender.
- **H11**: Users' perceptions of SSTs as reliable are affected by their educational level.
- **H12**: Users' perceptions of SSTs as convenient are affected by their educational level.
- **H13**: Users' desire for personal interaction is influenced by their educational level.
- **H14**: Technology anxiety associated with SST use is affected by users' educational level.

- **H15**: Technology readiness associated with SST utilisation is affected by users' educational level.

2.2 Research philosophy, approach and strategy

The present study aims to provide insights that could assist the development of user-centric self-service solutions, as well as their overall implementation at filling stations. For this reason, the research embraces objectivism as an ontological orientation and integrates the deductive approach. To be more specific, several hypothetical propositions have been formulated based on prior research in the SST field. This is followed by an analysis of quantitative data, gathered through a web-based self-administered questionnaire, to validate or refute these propositions.

In general, this approach allows a more objective evaluation of SST-related attitudes and intentions. Furthermore, the analysis of the tested relationships between the stated factors yields valuable insights into these attitudes and intentions. Such understanding could guide both practitioners and researchers in devising future courses of action for the successful implementation of SSTs.

It should be noted that the study denotes several biases and encompasses some challenges. Firstly, the social aptness bias may distort the interpretation of results. Secondly, the contextual factors also represent a bias of the study (e.g., speed of operating with an SST at a filling station). Finally, despite conducting a pretest of the questionnaire to mitigate potential inconsistencies, judgements related to urgency as a determinant of the reluctance to have personal interaction cannot be entirely controlled.

2.3 Research methodology: questionnaire

The questionnaire aims to explore respondents' familiarity with self-service solutions at filling stations, as well as their attitudes and usage intentions concerning such technologies. Furthermore, the survey seeks to examine the influence of demographic variables – age, gender and education – on respondents' SST-related attitudes and utilisation intentions through selected individual (desire for personal interaction, technology anxiety and technology readiness) and technological (perceived reliability and perceived convenience) factors. The population of interest encompasses active drivers who frequently visit filling stations, given their potential first-hand experience with SSTs. Convenience sampling is used to select respondents based on their availability and willingness to participate. The questionnaire was completed by 124 persons, of which 52.4% were males and 47.6% females. Ages ranged from 18 to 58 years, with an average age of 35.6 years. The most common age was 24 years, represented by 11 individuals. Respondents were divided into two age groups for the analysis: 18-38 and 39-58 years. With respect to educational attainment, 24.2% have secondary education, 46.8% hold a Bachelor's degree, 27.4% have a Master's degree and 1.6% possess a PhD degree.

The data are analysed using the Statistical Package for the Social Sciences (SPSS) by International Business Machines (IBM), where the process encompasses several key steps. Descriptive statistics are employed to examine participants' demographic characteristics, including age, gender and educational attainment. This entails the calculation of frequencies and descriptive measures. When concerning inferential methods, the chi-square test, Cramer's V coefficient and adjusted residuals are utilised to assess the presence or absence of relationships between the variables of interest. Yet, it should be noted that one of the

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limitations of the stated methods rests in the fact that they have a tendency to produce relatively low correlation measures. Alternatively, convenience sampling adds a degree of bias to the results and limits their accurate representation.

3 Research Findings and Discussion

Out of the 124 respondents, 59.7% have used SSTs at filling stations, while 40.3% have not utilised such solutions. On the one hand, among the respondents who have used SSTs, 42.7% report using such solutions more than 3 times, indicating a high level of familiarity. Additionally, 8.9% have utilised these technologies 2-3 times, suggesting a moderate level of familiarity, and 8.1% have used SSTs only once, demonstrating a relatively low level of familiarity. Regarding future intentions, 57.3% of the respondents express a willingness to use such solutions again, whereas 2.4% are unwilling to do so.

On the other hand, the respondents who have not utilised SSTs state several reasons for their lack of experience. Specifically, 13.7% report the unavailability of such solutions in their residential area, while 19.4% note the absence of these technologies at their preferred filling stations. Furthermore, 4.0% demonstrate disinterest in using SSTs, whereas 3.2% express apprehension due to unfamiliarity and perceived complexity. Notably, 29.1% of the respondents who have not used such solutions indicate a willingness to do so.

It can be concluded that a significant share of the respondents are both familiar with and positive towards SSTs at filling stations. Nonetheless, barriers such as availability of the technologies, apprehension and overall disinterest must be addressed to fuel future adoption. Additional research with a larger/more diverse sample is recommended to validate these findings.

The following tables provide a summary of the questionnaire findings and an overview of the hypothesis test results.

Table 3 | Overview of questionnaire findings

	Yes	Neutral	No
Associate SSTs with reliability	61.3%	16.1%	22.6%
Associate SSTs with convenience	84.7%	6.5%	8.9%
Prefer interacting with SSTs	33.9%	29.0%	37.1%
Exhibit SST apprehensiveness	29.8%	18.5%	51.6%
Demonstrate SST readiness	46.0%	22.6%	31.5%

Source: Authors' table based on collected quantitative data (2023)

Table 4 | Overview of questionnaire findings: age

	Associate SSTs with reliability	Neutral	Do not associate SSTs with reliability
18-38	41.9%	8.1%	11.3%
39-58	19.4%	8.1%	11.3%
	Associate SSTs with convenience	**Neutral**	**Do not associate SSTs with convenience**
18-38	56.5%	2.4%	2.4%
39-58	28.2%	4.0%	6.5%
	Prefer interacting with SSTs	**Neutral**	**Prefer interacting with service employees**
18-38	20.2%	19.4%	21.8%
39-58	13.7%	9.7%	15.3%
	Exhibit SST apprehensiveness	**Neutral**	**Do not exhibit SST apprehensiveness**
18-38	21.8%	13.7%	25.8%
39-58	8.1%	4.8%	25.8%
	Demonstrate SST readiness	**Neutral**	**Do not demonstrate SST readiness**
18-38	22.6%	16.1%	22.6%
39-58	23.4%	6.5%	8.9%

Source: Authors' table based on collected quantitative data (2023)

Table 5 | Overview of questionnaire findings: gender

	Associate SSTs with reliability	Neutral	Do not associate SSTs with reliability
Male	30.6%	10.5%	11.3%
Female	30.6%	5.6%	11.3%
	Associate SSTs with convenience	**Neutral**	**Do not associate SSTs with convenience**
Male	44.4%	4.8%	3.2%
Female	40.3%	1.6%	5.6%
	Prefer interacting with SSTs	**Neutral**	**Prefer interacting with service employees**
Male	18.5%	16.9%	16.9%
Female	15.3%	12.1%	20.2%
	Exhibit SST apprehensiveness	**Neutral**	**Do not exhibit SST apprehensiveness**
Male	9.7%	10.5%	32.3%
Female	20.2%	8.1%	19.3%
	Demonstrate SST readiness	**Neutral**	**Do not demonstrate SST readiness**
Male	29.8%	10.5%	12.1%
Female	16.1%	12.1%	19.4%

Source: Authors' table based on collected quantitative data (2023)

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Table 6 | Overview of questionnaire findings: education

	Associate SSTs with reliability	Neutral	Do not associate SSTs with reliability
Secondary education	18.5%	3.2%	2.4%
Bachelor's degree	28.2%	8.1%	10.5%
Master's degree	13.7%	4.8%	8.9%
PhD	0.8%	0%	0.8%
	Associate SSTs with convenience	**Neutral**	**Do not associate SSTs with convenience**
Secondary education	21.8%	1.6%	0.8%
Bachelor's degree	40.3%	3.2%	3.2%
Master's degree	21.0%	1.6%	4.8%
PhD	1.6%	0%	0%
	Prefer interacting with SSTs	**Neutral**	**Prefer interacting with service employees**
Secondary education	12.9%	7.3%	4.0%
Bachelor's degree	11.3%	14.5%	21.0%
Master's degree	8.9%	7.3%	11.3%
PhD	0.8%	0%	0.8%
	Exhibit SST apprehensiveness	**Neutral**	**Do not exhibit SST apprehensiveness**
Secondary education	2.4%	7.3%	14.5%
Bachelor's degree	20.2%	6.5%	20.2%
Master's degree	7.3%	4.0%	16.1%
PhD	0%	0.8%	0.8%
	Demonstrate SST readiness	**Neutral**	**Do not demonstrate SST readiness**
Secondary education	13.7%	6.5%	4.0%
Bachelor's degree	15.3%	8.9%	22.6%
Master's degree	16.1%	6.5%	4.8%
PhD	0.8%	0.8%	0%

Source: Authors' table based on collected quantitative data (2023)

Table 7 | Overview of hypothesis test results

Hypothesis	P-value	Effect size	Conclusion
$H1_0$: Users' age does not exert any influence on whether or not they perceive SSTs as reliable	0.122 > 0.05		Fail to reject
$H2_0$: Users' age does not exert any influence on whether or not they perceive SSTs as convenient			Reject
$H2_1$: Users' perceptions of SSTs as convenient are affected by their age	0.014 < 0.05	0.263	Accept
$H3_0$: Users' age does not affect their desire for personal interaction	0.732 > 0.05		Fail to reject
$H4_0$: Technology anxiety related to SST use is not affected by users' age			Reject
$H4_1$: Technology anxiety associated with SST use is affected by users' age	0.029 < 0.05	0.239	Accept
$H5_0$: Technology readiness related to SST utilisation is not affected by users' age			Reject
$H5_1$: Technology readiness associated with SST utilisation is affected by users' age	0.037 < 0.05	0.230	Accept
$H6_0$: Users' gender does not exert any influence on whether or not they perceive SSTs as reliable	0.469 > 0.05		Fail to reject
$H7_0$: Users' gender does not exert any influence on whether or not they perceive SSTs as convenient	0.250 > 0.05		Fail to reject
$H8_0$: Users' gender does not affect their desire for personal interaction	0.486 > 0.05		Fail to reject
$H9_0$: Technology anxiety related to SST use is not affected by users' gender			Reject
$H9_1$: Technology anxiety associated with SST use is affected by users' gender	0.013 < 0.05	0.265	Accept
$H10_0$: Technology readiness related to SST utilisation is not affected by users' gender			Reject
$H10_1$: Technology readiness associated with SST utilisation is affected by gender	0.030 < 0.05	0.238	Accept
$H11_0$: Users' educational level does not exert any influence on whether or not they perceive SSTs as reliable	0.351 > 0.05		Fail to reject
$H12_0$: Users' educational level does not exert any influence on whether or not they perceive SSTs as convenient	0.540 > 0.05		Fail to reject
$H13_0$: Users' educational level does not affect their desire for personal interaction	0.107 > 0.05		Fail to reject
$H14_0$: Technology anxiety related to SST use is not affected by users' educational level			Reject
$H14_1$: Technology anxiety associated with SST use is affected by users' educational level	0.032 < 0.05	0.236	Accept
$H15_0$: Technology readiness related to SST utilisation is not affected by users' educational level			Reject
$H15_1$: Technology readiness associated with SST utilisation is affected by users' educational level	0.017 < 0.05	0.249	Accept

Source: Authors' table based on collected quantitative data (2023)

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Age – perceived reliability

The present findings support Hypothesis 1_0, indicating that age does not affect users' perceptions of SST reliability. In addition, the present findings align with those of Weijters et al. (2007), suggesting that the perceived reliability of self-service solutions does not vary considerably across different age groups. Plausible explanations for this include the growing technological expertise of individuals of older age, as well as the general advancements in the reliability of technologies. Future studies could explore the influence of factors beyond age, such as income, occupation and cultural background, on SST reliability perceptions.

Age – perceived convenience

The present findings support Hypothesis 2_1, suggesting that age affects users' perceptions of SST convenience. Moreover, a comparison of the present findings with those of Chawla and Joshi (2017) reveals a consistent trend: individuals of younger age find technological solutions more convenient than persons of older age. This could be due to generational differences in technology adoption rates and comfort levels, with younger individuals exhibiting greater familiarity and proficiency in using technologies. Future research could explore the specific features of SSTs that contribute to perceived convenience across different age groups.

Age – desire for personal interaction

The present findings support Hypothesis 3_0, indicating that age does not influence users' desire for personal interaction. Additionally, a comparison of the present findings with those of previous research reveals a contrasting trend: according to Kang and Ridgway (2018), individuals of older age tend to prefer direct interactions with service personnel, while the present study does not find a statistically significant relationship between age and desire for personal interaction. This discrepancy could be attributed to the evolving societal norms and the advancements in service technologies, leading to increased comfort with technology-mediated interactions among persons of older age. Future studies could explore factors such as technological expertise and self-efficacy that might affect the desire for SST interaction among different age groups.

Age – technology anxiety

The present findings support Hypothesis 4_1, suggesting that age affects users' anxiety towards SSTs. What is more, a comparative analysis of the present findings with those of antecedent studies discloses incongruence: while Hertzog and Hultsch (2000) noted that individuals of older age exhibit apprehension towards self-service solutions, according to the present study, persons of older age are less apprehensive towards SSTs compared to younger ones. Possible reasons include the evolving technological familiarity of persons of older age and the advancements in user interfaces. Future research could examine SST-related concerns and explore the impact of technological expertise on SST apprehension in different age groups.

Age – technology readiness

The present findings support Hypothesis 5_1, indicating that age affects users' readiness to utilise SSTs. In addition, drawing a comparison between the present findings and those of prior research, an intriguing disparity is uncovered: according to Rose and Ogunmokun (2010), younger individuals are more willing to embrace technologies, while the present study reveals that persons of older age demonstrate higher readiness to use SSTs compared to younger individuals. This could be attributed to the evolving technological familiarity of persons of older age, as well as the advancements in technology accessibility. Future studies could examine the impact of self-efficacy and technology innovativeness on readiness to utilise such solutions across different age groups.

The present findings shed new light on the effect of age on the adoption of self-service solutions. Specifically, the results show that age does not influence perceived SST reliability. This suggests that growing technological familiarity and societal changes in technology usage may have reduced age-based differences in reliability perceptions. Nevertheless, notable disparities are observed in perceptions of SST convenience, as well as in anxiety and readiness when using such solutions. More precisely, persons of older age tend to exhibit lower levels of anxiety and higher readiness to utilise SSTs, though they perceive these solutions as less convenient compared to younger individuals. These findings encourage further exploration of other factors – e.g., income, occupation and cultural background – that could better explain SST-related attitudes and usage intentions and expand theoretical models of technology acceptance.

Practically, the present findings suggest that SST developers and marketers can approach reliability without extensive age-specific customisation, as this factor appears consistent across different age groups. However, targeted adjustments in convenience features, anxiety-reducing elements and readiness-building initiatives could improve the adoption of self-service solutions among specific age demographics. For instance, simplified interface designs and clear, step-by-step tutorials that reduce SST anxiety and increase SST readiness may be especially beneficial for younger persons, while individuals of older age may find value in features that enhance convenience, such as voice-activated commands or interactive tutorials and tooltips.

Gender – perceived reliability

The present findings support Hypothesis 6_0, suggesting that gender does not influence users' perceptions of SST reliability. Moreover, comparing the present findings with those of previous studies, a contrast emerges: although Ho et al. (2011) posited that females perceive technological products as less reliable than males, this study does not find a statistically significant relationship between gender and perceived reliability. These disparate findings indicate that the influence of gender on perceived reliability might vary across different technological contexts. Future research could investigate features of SSTs that contribute to perceived reliability across genders.

Gender – perceived convenience

The present findings support Hypothesis 7_0, indicating that gender does not affect users' perceptions of SST convenience. Additionally, a comparative analysis of the present findings with those of antecedent research reveals a consistency: Chawla and Joshi (2017) asserted that gender does not affect users' attitudes towards SSTs through perceived convenience,

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which aligns with the present study, where no statistically significant relationship is observed between gender and perceived convenience. This consistency could stem from evolving societal norms and the widespread adoption of technologies across genders. Future studies could examine the role that factors other than gender (e.g., income, occupation and cultural background) might play in shaping users' SST convenience perceptions.

Gender – desire for personal interaction

The present findings support Hypothesis 8_0, suggesting that gender does not affect users' desire for personal interaction. What is more, comparing the present findings with those of prior studies, a disagreement is unveiled: while Burke (2002) noted that females exhibit a higher preference for personal interaction with service personnel, this study does not find a statistically significant relationship between gender and desire for personal interaction. This incongruence could be explained by the evolving consumer behaviour and retail landscape changes, where streamlined interactions are prioritised irrespective of gender. Future research could explore individual and situational factors that might influence the desire for SST interaction across genders.

Gender – technology anxiety

The present findings support Hypothesis 9_1, indicating that gender influences users' anxiety towards SSTs. In addition, the present findings align with those of Todman (2000), according to which females exhibit higher levels of technophobia compared to males. A potential explanation could stem from the entrenched societal norms and cultural expectations that shape distinct technology perceptions for males and females. Future studies could explore the specific aspects of SSTs that contribute to apprehension among females (design elements, usability issues and psychological factors).

Gender – technology readiness

The present findings support Hypothesis 10_1, suggesting that gender affects users' readiness to utilise SSTs. Moreover, the present findings correspond to those of Venkatesh et al. (2003), according to which males exhibit higher technology readiness than females. This could be explained by many factors, including societal norms, cultural influences and varying technology exposure, which might have led to differences in technological expectations across genders. Future research could explore areas where females perceive higher effort or lower self-efficacy regarding SST utilisation.

The present findings provide valuable insights into the impact of gender on SST acceptance. To be more precise, the results indicate that gender does not affect the perceived reliability and perceived convenience of such solutions. This may be attributed to the increasing exposure to and familiarity with technology, which has led to more equitable perceptions of SST attributes across genders. Still, notable differences persist in anxiety and readiness when using self-service solutions; specifically, females tend to exhibit higher levels of anxiety and lower readiness to utilise SSTs compared to males. These findings highlight the need to consider additional factors – e.g., individual confidence with technology, educational background and contextual experiences – to better understand SST-related attitudes and usage intentions and enrich theoretical models of technology adoption.

From a practical standpoint, the present findings suggest that developers and marketers of self-service solutions should focus less on gender-specific customisation for attributes such as perceived reliability and perceived convenience. Nonetheless, targeted interventions aimed at reducing SST anxiety and enhancing SST readiness – for example, incorporating user-friendly design elements and offering guided tutorials – could help alleviate apprehension and bolster confidence among females in using self-service solutions.

Education – perceived reliability

The present findings support Hypothesis 11_0, indicating that education does not affect users' perceptions of SST reliability. Although there is no previous research specifically examining the effect of education on SST reliability perceptions, a plausible explanation for the present findings could be the increasing ubiquity of technology, leading to a heightened familiarity irrespective of education. Future studies could investigate the influence of factors beyond education, such as income level, occupation and cultural background, on SST reliability perceptions.

Education – perceived convenience

The present findings support Hypothesis 12_0, suggesting that education does not influence users' perceptions of SST convenience. Additionally, a comparative analysis of the present findings with those of antecedent research reveals consistency: Chawla and Joshi (2017) posited that education does not significantly influence attitudes and intentions towards self-service solutions through perceived convenience, which aligns with this study, where no statistically significant relationship is observed between education and perceived SST convenience. A possible explanation for this could be the increasing technological familiarity across different educational levels. Future research could examine the role that factors other than education, such as income level, occupation and cultural background, might play in shaping SST convenience perceptions.

Education – desire for personal interaction

The present findings support Hypothesis 13_0, indicating that education does not affect users' desire for personal interaction. What is more, the present findings align with those of Weijters et al. (2007), according to which education does not significantly affect attitudes and intentions related to SSTs through the desire for personal interaction. This could be attributed to the evolving technological landscape, which has reshaped consumers' interactions across various retail settings irrespective of their education, as well as to diverse cultural norms and communication styles. Future studies could investigate the influence of other factors beyond education (e.g., income, occupation and cultural background) on the desire for SST usage.

Education – technology anxiety

The present findings support Hypothesis 14_1, suggesting that education affects users' anxiety towards SSTs. In addition, after comparing the present findings with those of prior research, a difference is uncovered: while Porter and Donthu (2006) posited that individuals with lower educational attainment might avoid using SSTs due to apprehension, this study reveals that persons with a Bachelor's degree are more likely to exhibit anxiety towards such solutions compared to those with secondary education. A reasonable explanation for this could be the higher expectations of technological proficiency among the more educated individuals, leading

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to greater concerns about perceived competence. Future research could explore the impact of self-efficacy on technology apprehensiveness across educational levels.

Education – technology readiness

The present findings support Hypothesis 15_1, indicating that education influences users' readiness to utilise SSTs. Moreover, drawing a comparison between the present findings and those of previous studies, a captivating disparity is uncovered. While Ramayah et al. (2004) noted that individuals with lower educational attainment exhibit reduced levels of technology readiness compared to those with a Master's degree, according to this research, Bachelor's degree holders are less likely to demonstrate readiness to use SSTs than those with secondary education. This could stem from various factors that might mitigate the influence of a Bachelor's education on technology readiness. Future studies could explore how cognitive abilities and socioeconomic background affect technology readiness at different educational levels.

The present findings contribute to a deeper understanding of how education influences the adoption of self-service solutions. More precisely, the results show that educational attainment does not affect users' perceptions of SST reliability and convenience. This suggests that as self-service solutions become increasingly ubiquitous, familiarity may override educational differences in these perceptions. Still, the notable impact of education on anxiety and readiness when utilising SSTs indicates that educational background can lead to varying levels of apprehension and willingness to use such solutions. These results call for further exploration of other factors – e.g., income, occupation and cultural context – that could further illuminate the nuances of SST-related attitudes and usage intentions across different educational levels and expand theoretical models of technology acceptance.

From a practical perspective, the present findings suggest that developers and marketers of self-service solutions should not prioritise educational attainment when addressing perceptions of reliability and convenience, as these factors appear to be consistent across different educational levels. However, to effectively address SST anxiety and enhance SST readiness, targeted interventions are necessary. Implementing features such as intuitive user interfaces and providing tailored educational resources or tutorials could help alleviate apprehension and build confidence among users, particularly those with higher attained education.

Conclusions

Technological evolution has led to profound transformations across industries, fundamentally altering the dynamics of interactions between customers and companies. Businesses are increasingly turning to SSTs to improve operational efficiency and enhance customer satisfaction (Scherer et al., 2015). Despite the considerable body of research, previous studies have primarily focused on SSTs in specific establishments, such as hotels, restaurants and retail stores (Weijters et al., 2007; Oh et al., 2013) and a notable literature gap exists regarding such solutions at filling stations. Moreover, when investigating users' attitudes towards these technologies, the majority of research works have emphasised certain technological and individual factors (Meuter et al., 2005; Lee et al., 2010), largely overlooking the influence of demographic variables.

The present study attempted to address this gap by investigating Bulgarian users' attitudes towards SSTs at filling stations. More precisely, the research explored the effect of demographic variables, namely, age, gender and education, on these attitudes through selected individual (desire for personal interaction, technology anxiety and technology readiness) and technological factors (perceived convenience and perceived reliability). The results reveal a significant level of familiarity among Bulgarian users with SSTs at filling stations. Furthermore, there is a prevalent positive inclination towards the adoption of these technologies, suggesting a generally favourable perception of their benefits and utility.

A noteworthy finding of our research is the relationship between age and perceived convenience, with younger individuals tending to view SSTs at filling stations as more convenient compared to persons of older age. In addition, age is also linked to technology anxiety and technology readiness, with individuals of older age exhibiting a lower level of apprehension and a higher degree of readiness to utilise such technologies compared to younger persons.

Gender differences also emerge, particularly in relation to technology anxiety and technology readiness. To be more specific, females exhibit greater levels of apprehension and a lower degree of readiness to use self-service solutions at filling stations in comparison to males.

Lastly, the study uncovered relationships between education and technology anxiety and education and technology readiness. More precisely, individuals with a Bachelor's degree tend to exhibit a higher level of apprehension and a lower degree of readiness to use SSTs at filling stations compared to persons with secondary education.

By and large, SSTs have evolved to a stage where they offer customers quick and accessible information with various other capabilities (payment, monitoring and access to information, among others). These solutions offer immense opportunities to reduce costs, increase efficiency and complement existing revenue streams. From a customer point of view, they could enhance satisfaction through the provision of faster solutions to their needs, user-friendliness and ongoing improvements based on real-time interaction analytics. In view of this, future research agenda may focus on usage of SSTs for value creation at filling stations, measurement of the overall shopping experience as supported by SSTs, and customer-led automation recognising the generational variables. Additionally, it is recommended for future research to accentuate other demographic variables to more entirely disclose the nexus between attitudes and usage intentions. Finally, it is of paramount importance to conduct a replica study across other CEE countries so that cross-country results can be compared and patterns can be identified.

In light of the research findings, it is advised that businesses consider demographic variations when designing and implementing SSTs. Crafting user experiences that cater to age, gender and education differences could enhance user acceptance and foster positive engagement with self-service solutions at filling stations. Overall, the findings of this study are valuable for all SST providers in CEE as they could allow expansion of the customer base and generation of new revenue streams.

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