Received 20 June 2022
Revised 9 November 2022
13 December 2022
Accepted 27 December 2022

Amidst technology, environment and human touch. Understanding elderly customers in the bank retail sector

Michela Cesarina Mason, Gioele Zamparo and Rubens Pauluzzo
Department of Economics and Statistics, University of Udine, Udine, Italy

Abstract

Purpose – Using retail banking as a setting and focusing specifically on elderly customers (i.e. individuals aged 60 or more), this study aims to deepen the current understanding of how the physical context and the need for human interaction influence elderly customers' attitudes toward self-service technologies (SSTs) and their behavior.

Design/methodology/approach – Using face-to-face questionnaires, a sample of 505 elderly bank customers was collected. Data were analyzed using a multi-method approach, combining a moderated mediation analysis with a fuzzy-set qualitative comparative analysis.

Findings – The findings suggest that a pleasant retail space may result in a positive attitude toward SSTs, which increases their co-creation intention. It also highlights that need for interaction of elderly customers with employees has detrimental effects on their attitude toward SSTs.

Research limitations/implications – The current analysis was carried out among Italian elderly banks' customers. Thus, the results are highly dependent on the context of the analysis. In addition, it does not consider the different degrees of knowledge and experience the elderly may have with technology.

Practical implications – This study suggests that providing access and support for using technology may be essential for banks to facilitate SSTs adoption in elderly customers.

Originality/value – To the best of the authors' knowledge, this study represents the first attempt to examine the influence of the physical context on elderly customers' attitudes toward SSTs and their consequent behavioral intentions. Furthermore, it highlights the importance of the human touch for these particular customers.

Keywords Elderly customers, Physical context, SSTs, Retail banks, Need for human Interaction, Cocreation

Paper type Research paper

1. Introduction

When the coronavirus disease (COVID-19) pandemic first hit the world in March 2020, radical changes occurred in the retail sector worldwide. As a result, SSTs have been widely adopted in the banking sector to replace face-to-face service interactions, creating new environments for retailers, service providers and customers. From the customer perspective, however, the adoption of SSTs has also generated a significant behavioral change, as the user becomes the service co-producer who self-engages in value-creating activities with little or no interaction with the employees (Payne *et al.*, 2018, 2021). Nevertheless, SSTs may generate doubts and queries in people's minds, especially among those less prone to technologies. Such a situation is quite prevalent among elderly adults. Elderly customers are defined as those at least 60 years old or, on average, 65 years old (Guido *et al.*, 2022). These individuals are considered

Declaration of conflict of interest: None.

International Journal of Bank Marketing
Vol. 41 No. 3, 2023
pp. 572-600
Emerald Publishing Limited
0265-2323
DOI 10.1108/IJBM-06-2022-0256

"digital immigrants" (Prensky, 2001) who learned to use technology only as adults, and several studies found them to be averse to the use of SSTs (McPhail and Fogarty, 2004; Simon and Usunier, 2007).

This massive incorporation of SSTs – which has rapidly reshaped service industries' nature and setting (Reis *et al.*, 2020) – has modified retail banks' services in two ways. First, the physical environment has changed. The number of SSTs present on-site has increased and altered the physical context. Second, the customers have passed from facing a human clerk to facing a technological device. Overall, these modifications may have drastically changed the elderly customer experience. Elderly customers want a welcoming and pleasant service environment with a functional layout and a friendly atmosphere (Fu and Parks, 2001; Moye and Giddings, 2002). Moreover, they value emotional relationships with others more and may prefer human service to SSTs (Curran and Meuter, 2005). This group was found to have "a strong and direct negative effect on preferences for SST over personnel-in-contact" (Simon and Usunier, 2007, p. 170), as these customers see service encounters also as an opportunity to mingle.

The pandemic has put elderly customers in front of a new context: a mutated physical environment and a new type of human-less service encounter. However, few studies have explored how elderly customers behave in these new retail bank settings, highlighting a significant knowledge gap in the service literature (Guido *et al.*, 2022; Lee and Lyu, 2019). This age cohort may be considered the next generation of banking customers for personalized services (Albashrawi and Motiwalla, 2019; Rajaobelina *et al.*, 2020; Shevelin, 2020; Sinha and Singh, 2022). They are increasing in number, more loyal and ready to pay more for services than their younger peers (Chaouali and Souiden, 2019). Additionally, in the post-pandemic marketplace, the elderly will be forced to adapt to the absence of staff within service facilities (Meuter, 2022). Coherently, a higher pressure to substitute the interaction with the personnel with SSTs for service delivery will also be present (Wang *et al.*, 2022). Nevertheless, the significant expansion in the practice of SSTs – and the related reduction of human interactions–has not been paralleled by academic efforts to understand how these changes affect the elderly cohort.

Per se, technology is one of the elements of the service environment (Pareigis *et al.*, 2011). In particular, in gerontology and marketing literature, environment and technology are deemed as critical elements in influencing the behavior of senior customers, yet the interaction between these two factors remains largely overlooked (Angell *et al.*, 2014; Park *et al.*, 2021; Rajaobelina *et al.*, 2020; Tomazelli *et al.*, 2017). The contextual and physical elements that characterize the service facilities may promote or impair access to the service machinery, influencing its actual usage. Yet, in the SSTs literature, despite the great attention paid to the service machine characteristics (Gerrard and Barton Cunningham, 2003; Gong *et al.*, 2022; Kim and Park, 2019; Lee and Lyu, 2019), few studies have explored the link between service environment characteristics and technology usage, especially in the elderly cohort (Guan *et al.*, 2021). Understanding this is thus critical for designing better service environments for this elderly segment in the post-pandemic scenario.

Furthermore, technology adoption is also related to customers' need for human interaction. The forced digital transformation has severely reduced human interactions among retail banks and their customers. Even before the pandemic, the loss of human contact was considered one of the main issues related to the diffusion of SSTs (Collier and Kimes, 2013; Demoulin and Djelassi, 2016), and, in the post-pandemic scenario, service retailers will plausibly keep offering a mix of interpersonal and technological-based services, more unbalanced towards the latter (Meuter, 2022). Nevertheless, this deprivation of social contact may increase the isolation and loneliness that already characterize the elder cohort (Patel and Clark-Ginsberg, 2020). In this regard, even the interactions with the service employees may fulfill the elderly' social needs (Song *et al.*, 2018). As retail encounters between senior customers and SSTs are increasing, exploring to what extent the absence of human

interaction has detrimental effects on customers' co-creation via SSTs is fundamental, especially in the current scenario (Shiwen *et al.*, 2022; Tussyadiah, 2020).

In order to fill these gaps and by adopting Mehrabian and Russell's (1974) Stimulus–Organism–Response (SOR) model, this study attempts to understand the causal relationships between environmental elements and SSTs usage. Specifically, the physical context is conceptualized as a set of stimuli capable of influencing elderly customers' internal state (i.e. their attitude toward SSTs), which, in turn, elicit a specific behavioral response (i.e. intention to engage in co-creation activities with SSTs). Furthermore, the friction between human touch and technology is captured by the need for human interaction, which is a moderating factor in the relationship between elders' attitudinal stance towards technology and related intention. The present paper uses moderated mediation analysis and fuzzy-set qualitative comparative analysis (fsQCA) to test the abovementioned relationships.

The study's contribution is threefold. First, it explores the relationships between the physical environment, SSTs and co-creation behaviors. Second, by using fsQCA, this investigation detects the combinations of the different components of the physical environment that may increase elderlies' intention to co-create via SSTs. Third, it explores the social elements that may influence the adoption of SSTs in elderly customers, thus revealing a moderating role of the need for human interaction in this specific context. More broadly, the paper extends the body of research on elderly customers and offers new knowledge about their co-creation intention via SSTs, contributing to the marketing theory by exploring the effects of environmental clues–the first element of the customer experience–on elderly customers' reactions. Additionally, by splitting the sample in two (i.e. young elderly and older elderly), this study highlights that the model relationships become more pronounced with age. Finally, regarding the practical contribution, this study offers meaningful insights into what retail banks need to address to offer appropriate services to elders via SSTs.

The study is organized as follows. Section 2 provides the theoretical foundations and the study's hypotheses. Section 3 presents the methodology, while section 4 exhibits the analysis results. Section 5 discusses the results, highlighting the practical and theoretical implications. Finally, section 6 reports the study's limitations and future research directions.

2. Theoretical framework

2.1 Senior customers in the retail context

Western societies are witnessing a "grey tsunami" (Longman, 2011) that is predicted to vastly impact businesses, healthcare and public sectors. Worldwide, the 60+ age group is expected to reach 1.3 billion units by 2030. In 2021, with 23.4% of citizens over 65, Italy was the second country in the world for longevity after Japan, with an increase of 4.46% in the last five years (Istat, 2021). Over time, the continuous growth in longevity and the constant decline in fertility have made Italy one of the oldest countries in the world. In 2021, the old age index, which represents the ratio of the population over the age of 65 to the population under the age of 15, reached 183.3%, still growing compared to 2017 (165.9%) (Istat, 2021; World Data Atlas, 2022). Moreover, in Europe, the spending power of the elder cohort will reach 5 trillion dollars by 2030 (World Data Lab, 2019). Unsurprisingly, the steep increase in the demographics and purchase power–that will characterize the elderly population in the future–has attracted researchers' and practitioners' interest. Several authors have studied elders as customers. In particular, two streams of research dominate the literature: the first one aims to highlight the changes in information processing, while the second analyses the changes in consumer behavior related to cognition, affect and behavior (Lopes and Garcia, 2019). As for the retail sector, two salient aspects characterizing elderly people have been emphasized in the literature: the need to interact with others and age-related impaired capabilities (Joyce and Lambert, 1996).

As regards the need for human interaction, the role of sales personnel has been emphasized by many scholars (Bianchi, 2021; Johns and Davey, 2019; Leino, 2017; Moschis *et al.*, 2003). For elderly customers, having a friendly and helpful staff is associated with higher satisfaction and other positive outcomes (Lu and Seock, 2008; Meneely *et al.*, 2008). This peculiar need is determined by the assistance elders have to receive to carry out several activities successfully (e.g. using SSTs, finding something on a shelf, or exploring the service environment). Furthermore, researchers agree that elders care not only for the utilitarian benefit deriving from the service encounters but also for the social contact embedded within these interactions (Kim *et al.*, 2005; Myers and Lumbers, 2008; Pettigrew, 2007). The age-related impairments can cause several in-store difficulties and challenges elders face in the retail store environment. For example, Pettigrew *et al.* (2005) identified the functionality of the retail environment and the appropriate placement of products on the shelves as sources of potential problems for elderly customers. Yin *et al.* (2013) highlighted other areas of concern, such as shelf height, poor signage and labeling. Moye and Giddings (2002) reported that elders would not return and avoid looking around in retail stores without chairs or benches. Regarding retail store lighting and the influence of the color of light on readability and overall color perception, elderly customers reported difficulties with warmer lighting when value contrasts were reduced (Park and Farr, 2007). These studies sustain the importance of physical context and human interaction in shaping elders' in-store experiences. Moreover, recent literature has also reported that environmental elements may impact the customers' attitudes and behaviors involving technology (Gelderman *et al.*, 2011; Guan *et al.*, 2021; Taufik and Hanafiah, 2019).

With reference to SSTs, these technologies continue to face considerable resistance among older customers who shy away from them (Lee and Lyu, 2019). Reaping the benefits of SSTs can be challenging for retailers when no sufficiently large critical mass of elderly customers can be convinced to use them. Therefore, questions about whether and why elderly customers adopt SSTs remain important, as well as focusing on the barriers leading the elderly to avoid technology. Moreover, these barriers may not be only related to the technology itself or its characteristics. They may also be connected to other factors, such as the physical context in which the technologies are embedded, or the peculiar social needs felt by the elderly cohort. Nevertheless, the interaction between physical, technological and human factors has been overlooked for elderly customers in the retail banking sector (e.g. Lai and Chong, 2020; Lee and Lyu, 2019; Moye and Giddings, 2002; Sinha and Singh, 2022)). Thus, there is a need to understand these relations better.

2.2 Physical context and co-creation intention

In the relationships between the firm and its customers, value is not merely created and provided to passive customers; instead, it is the result of a co-creation process between the firm and its active customers through interaction and dialog (Payne *et al.*, 2009). This process of co-creating value is usually based on exchanging knowledge and skills with the customers (Vargo and Lusch, 2004) and co-producing unique experiences (Prahalad and Ramaswamy, 2004). Prahalad and Ramaswamy (2000), focusing particularly on the impact of the Internet on the customer-firm relationship, argued that customers represent a source of competence. In this regard, value co-creation is thus recognized as the active engagement of customers with specific skills and knowledge in service (Prahalad and Ramaswamy, 2000). According to this perspective, firms and customers collaborate in co-creating value with joint extraction of value, thus shifting the focus from a firm-centric to a co-creation point of view (Prahalad and Ramaswamy, 2004). Consequently, the value created has personal characteristics, and each customer develops a unique perception of that value (Vargo and Lusch, 2008). In this respect, Vargo and Lusch (2008) highlighted the significance of operant resources, capable of acting

on other resources, such as skills and knowledge, and operand resources, that are acted upon, such as goods, as well as how their integration and application creates value through interaction and the exchange of a service.

From an experiential perspective, the space where the interactions between the firm and its customers occur becomes a cognitive and emotional place (Russo Spena *et al.*, 2012). Consequently, firms have started developing in-store strategies based on ambient conditions, spatial layout and functionality, and signs, symbols and artifacts to encourage specific forms of customers' experiences and actions (Bitner, 1992) as potential tools for value creation (Fox and Sethuraman, 2006; Grewal and Levy, 2007). In this regard, choosing the right physical environment to reach the desired customer experience can contribute to the value creation for customers and the firm itself (Gentile *et al.*, 2007). The physical context in which a service process occurs can thus turn into an experiential environment, enabling value co-creation processes. More specifically, in developing co-creation centered processes and experiences, service providers adjust the service environment to encourage customers' engagement and willingness to co-create (Mathis *et al.*, 2016). In addition, they should also ensure that the customers experience a conducive psychological environment or safe space to co-create (Oertzen *et al.*, 2020). For service providers, this means acting on the contextual variables related to their physical service environment to influence customers' responses, particularly the evaluative outcomes of customer experience (Becker and Jaakkola, 2020). In this context, several salient factors shape and define the service encounters in the physical environment. These stimuli affect the customers' individual experiences and willingness to participate in co-creation. In this respect, the overall physical environment is thus intended as an operant resource capable of influencing customers' attitudes and, most importantly, behaviors during service experiences (Im and Qu, 2017). As a result, the physical context can enhance customers' experiential value (Ryu *et al.*, 2012) and, in turn, increase their intention to co-create (Prayag *et al.*, 2020).

Retail banks may be interested in leveraging the physical context to achieve more value in service delivery (Ma *et al.*, 2017). Within the value co-creation perspective, banks' commercial spaces are suitable for enacting actions to facilitate the part-take of customers in co-creation processes. Age-related physical impairments, such as impaired vision or hearing and lack of mobility, can constrain seniors' ability to perform physical tasks (Kim and Jang, 2019). Thus, offering older customers a retail environment that satisfies their functional and social needs may influence their co-creation intention. In particular, in the service sector, a close and intensive collaboration between firms and older adults is key to successfully implementing specific services for them (de Boer *et al.*, 2020; Verbeek *et al.*, 2020). In this regard, co-creation is more than the mere collaboration between the firm and its older customers since it represents, through the process of sharing knowledge and values, the joint creation of fundamental cognitive and emotional goals (Russo Spena *et al.*, 2012; Voorberg *et al.*, 2015). Hence, the physical environment should be congruent to promote overall well-being and everyday functioning for elderly customers, thus enhancing their perceived value and intentions to co-create (de Boer *et al.*, 2020). For retail banks, this means creating a service environment starting from the needs and characteristics of these peculiar customers, which may prompt positive behavioral responses and willingness to co-create (Mathis *et al.*, 2016). Following the above, the subsequent hypothesis is proposed:

H1. The physical context of retail banks is positively related to elderly customers' intention to participate in the co-creation experience.

2.3 The interaction between the physical context and customers' attitudes toward SSTs

In marketing, several studies demonstrated that the effects of the environment are mediated by cognitive and affective responses (Babin *et al.*, 2003). In her framework, Bitner (1992)

proposes that the perceived servicescape does not directly cause people to behave in specific ways. Instead, these perceptions are believed to lead to specific cognitive, emotional and physiological responses, which, in turn, influence behavior. Such relations are also moderated by personal, situational and socialized factors (Bitner, 1990, 1992). Thus, the physical context enhances customers' emotional and cognitive responses and affects their attitudes, perceptions and retail behaviors (Bellizzi and Hite, 1992).

The environment considerably impacts older people's ability to perform specific tasks. With their pioneering studies about environmental gerontology, Lawton and Simon (1968) provided a valuable framework for studying the interrelations between elderly persons and their physical-social environments, highlighting how these relations shape elderlies' behavioral outcomes (Wahl and Weisman, 2003). Environment and aging studies have viewed the environment as a potential source of stress on an individual and have examined its impact on elderly adults' behavioral outcomes (Chaudhury and Oswald, 2019; Lawton and Nahemow, 1973). Many studies have addressed the relationship between physical environments and elderly adults (Gitlin, 2003; Hutchings *et al.*, 2008; Wahl *et al.*, 2009). The physical environment plays a significant role in addressing age-related impairments as it allows elderly customers to navigate through the service experience more easily. Research studying how to create retail environments suitable for elderly customers has pointed out different physical elements that may influence elderly customers' in-store experiences (e.g. easy-to-follow store layout, non-slippery flooring, properly designed tags and menus) (Almanza *et al.*, 2017; Ann and Koenraad, 2010; Seo and Fiore, 2016; Yin *et al.*, 2013). These physical elements are certainly sector-specific. Nevertheless, these physical clues significantly influence the attitude of elderly customers. For example, the physical context where SSTs are located is the first set of stimuli the customers see while utilizing SSTs *in situ*. Thus, the aesthetic and functional features of the retail banks' physical context contribute to the formation of customers' attitudes.

Some authors have recognized the physical context as one of the critical factors affecting individuals' attitudes toward SSTs. For example, Xie *et al.* (2011) offered empirical evidence that the physical environment positively influences customers' attitudes toward self-service machines, stating that a pleasurable consumer experience, which is also determined by the physical settings of the service environment, facilitates customers' interaction with SSTs. In a similar vein, Guan *et al.* (2021) remarked on the importance for service enterprises to properly design the service environments where SSTs are located, as the physical context largely influences the customers' first impression about the service experience as well as their willingness to get involved with the SST. Indeed, from the perspective of environmental gerontology, SSTs can significantly contribute to a stimulating environment for successful aging since they have great potential to enhance independence for elderly individuals and may be related to health, cognitive functioning, independence maintenance and social inclusion in advanced age (Czaja *et al.*, 2018; Forsman and Nordmyr, 2017; Lawton, 1983; Rowe and Kahn, 1997; Schulz *et al.*, 2015; Sims *et al.*, 2016). Moreover, environmental factors are important when investigating technology adoption by older adults (Schlomann *et al.*, 2020). Environment-related factors can comprise social factors and technical-spatial environment, in which new technologies can represent an enrichment of the environment and, at the same time, new requirements for elderly individuals (Chaudhury and Oswald, 2019; Wahl *et al.*, 2012; Wahl and Gerstorf, 2018). Context domains and technology shape developmental outcomes, such as health and well-being (Wahl and Gerstorf, 2018). More specifically, the automation allowed by everyday technology has changed how older people interact with the environment (Czaja *et al.*, 2001; Fozard, 2005). In particular, regarding the technology environment, SSTs can make a positive difference in elderly customers' lives, including those with age-related impairments (Rogers and Fisk, 2010; Topo, 2009; Wahl *et al.*, 2012). In this regard, environmental factors are thus crucial for the adoption of technology among older adults (Schlomann *et al.*, 2020).

Even though elderly customers may be averse to the use of SSTs (Dean, 2008; Lee and Lyu, 2019; McPhail and Fogarty, 2004; Simon and Usunier, 2007), a well-designed physical environment (where the service machinery is signaled out and located in an accessible and comfortable position for the elderly consumer to reach) can support the sensory impairments of older adults and stimulate a positive attitude toward SSTs, thus increasing elderly individuals' willingness to engage with them. Hence, the following hypothesis is proposed:

H2. The physical context of retail banks is positively related to elderly customers' attitudes toward SSTs.

2.4 SSTs and co-creation in the retail banking context

In the case of SSTs, customers act as active parts of the service delivery through the interaction with platforms that offer opportunities for resource integration and support participation in product innovation or service improvement (Foroudi *et al.*, 2018). Customers can use SSTs in the bank's settings and accept the superior functions to achieve more personalized interactions and improved experiences (Park *et al.*, 2021). In this respect, participating in independent actions granted by these contacts allows customers to co-create value since SSTs provide them with the needed resources. In brief, SSTs provide customers with increased flexibility, efficiency and convenience in service delivery, even though they require skills and knowledge to operate (Scherer *et al.*, 2015). Concerning SSTs, co-creation cannot occur without customers' co-production (Hilton and Hughes, 2013). Therefore, customers' attitude toward innovative technologies-enabled services directly influences their value co-creation intentions (Lalicic and Weismayer, 2021).

Following the above, the impact of SSTs adoption on customers' co-creation in retail has drawn significant attention in the last few years. For instance, Zhang *et al.* (2021) suggested that SSTs can provide customers with a wide range of services while simultaneously promoting the engagement and enhancement of the co-creation experience. Furthermore, Hsu *et al.* (2021) examined co-creation and co-destruction in SSTs and argued that customers are more likely to continuously co-create value in case of misuse of resources, process failures and in-process co-creation strategies. In this line of research, several authors connected the attitudinal evaluation of SSTs with the co-creation intentions of the users (Carranza *et al.*, 2021; Mostafa, 2020; Payne *et al.*, 2021). These studies demonstrated that a positive attitude toward service machines directly influences customers' willingness to engage in co-creation behaviors.

Nevertheless, among these studies, none focused on elderly customers' co-creation intentions. Customers need to be capable, effortful and willing to engage resources to create value and for co-creation to occur (Lusch and Vargo, 2014). Indeed, when customers interact with SSTs, they need to collaborate with the resources (resource integration) provided by the organization (technological interfaces) with or without the presence of organizational employees (Galdolage, 2021). Nonetheless, elderly customers, with their diminished resources and skills to apply to value-generating processes (Dickson *et al.*, 2016), are deemed to play a hesitant role in technology-mediated co-creation processes. Age-related impairments that affect visual, auditory, motor and cognitive capabilities, a lack of formal technology training and frustration with technology can exacerbate the age-related digital divide (Bianchi, 2021; Blaschke *et al.*, 2009; Lee *et al.*, 2011; Pantano *et al.*, 2022). This could hinder co-learning, thus causing value co-destruction (Galdolage, 2021).

However, this may not be the complete picture. Some scholars have argued that elderly individuals may be fully capable of integrating resources and co-creating value through SSTs (Karahasanović *et al.*, 2009) if the conditions to facilitate technology adoption are met (Bianchi, 2021). Such a perspective has its own foundations in a process that we have been witnessing in the last few years, according to which elderly customers have been changing

from having just instrumental motivations for using computers and the Internet, to recognizing them as valuable tools for communication, socialization and engagement (Karahasanović *et al.*, 2009). In particular, during the COVID-19 pandemic, technology has become a fundamental part of elderly people's lives, helping them maintain their independence, reduce depression and enhance their well-being (Bianchi, 2021; Heinz *et al.*, 2013; Kavetsos and Koutroumpis, 2011; Wallcook *et al.*, 2021). In this respect, value co-creation behaviors can even support the elderly in dealing with aging issues, improving service inclusion and increasing well-being (Davenport *et al.*, 2012; Pera *et al.*, 2020). In the service context, in particular, technology does create value for elderly individuals (Čaić *et al.*, 2018, 2019; Khaksar *et al.*, 2017). By widening resource accessibility, increasing engagement and agency, and enabling resourceness, SSTs can positively affect elderly people's value co-creation (Mele *et al.*, 2022). More specifically, through SSTs, elderly customers can overcome cognitive and physical boundaries and reach new knowledge and capabilities, thus increasing resourceness. Consequently, SSTs promote resource integration and matching as the main mechanism of value co-creation (Lusch and Vargo, 2014; Mele *et al.*, 2022). Thus, the following hypothesis is proposed:

H3. In elderly customers, the attitude of retail banking customers toward SSTs positively influences their co-creation intentions.

2.5 SSTs and the need for human interaction

The forced digital transformation caused by COVID-19 has partially deprived retail banks of their human touch. Traditional retail channels provide a "social contact" which modern technologies lack. Some customers prefer dealing with a person rather than an SST. This preference is embedded in the need for human interaction concept, which represents "the extent to which customers importantly perceive human interaction during a service encounter" (Dabholkar and Bagozzi, 2002, p. 188). Individuals with a strong need for human interaction prefer human contact to human-computer interaction. More specifically, the loss of personal contact has been identified as one of the primary challenges in the large and massive diffusion of SSTs (Collier and Kimes, 2013). For instance, Demoulin and Djelassi (2016) suggested that the need for human interaction has a negative impact on perceived usefulness and intention to use SSTs, arguing that some customers may perceive SSTs as dehumanizing. Gelderman *et al.* (2011) stated that a strong preference for personal contact would increase the reluctance to use automated processes, and Taufik and Hanafiah (2019), reporting similar results, claimed that the need for human interaction is mainly dependent on customers' characteristics. In this regard, customers' attitude toward SSTs depends not only on functional results but also on the ability to fulfill social-emotional and relational needs (Fernandes and Oliveira, 2021; van Doorn *et al.*, 2017; Wirtz *et al.*, 2018).

In general, elderly customers are among those who need more assistance when interacting with technology. In the technological context, human interaction is considered a fundamental factor for understanding users' needs (Ashfaq *et al.*, 2020; Dabholkar and Bagozzi, 2002; Kokkinou and Cranage, 2015). Thus, acknowledging the tension between elderly customers' attitudes toward technology and their need for personal interaction is essential to understanding how value co-creation can be conveyed using SSTs. In this regard, when interacting with an SST, elderly customers with strong human interaction needs could perceive lower communication quality and high privacy risks (Ashfaq *et al.*, 2020; Hu *et al.*, 2021; Song *et al.*, 2022). They could even avoid IT-based self-services; therefore, such services reduce intrinsic motivation to co-create (Dabholkar and Bagozzi, 2002).

Conversely, elderly customers with a low need for human interaction will search for technological options, thus enhancing their intention to co-create (Dabholkar and Bagozzi, 2002). Indeed, the decreased cognitive ability and aversion to technology reduce elderly

customers' willingness to participate in value co-creation behaviors (Plaud and Guillemot, 2015). In addition, users with little experience interacting with SSTs may feel less confident, more uncertain and less comfortable than experienced users and more determined to interact with a human service employee rather than an SST (Ashfaq *et al.*, 2020). As a result, elderly adults may need help from other actors in the service system that act as mediators (Bianchi, 2021; Johns and Davey, 2019; Leino, 2017). Furthermore, senior customers may see these interactions as pleasurable, as these experiences are an opportunity to socialize (Moschis *et al.*, 2003; Patel and Clark-Ginsberg, 2020). Therefore, it is reasonable to assume that strong human interaction needs will reduce the positive effect of customers' attitudes toward SSTs on co-creation intentions. Based on these considerations, the following hypothesis is developed:

H4. In elderly customers, the need for human interaction negatively moderates the relationship between the attitude toward SSTs and their co-creation intentions.

Following all the hypotheses made, Figure 1 depicts the conceptual model proposed. As previously mentioned, the study relies on the SOR model (Mehrabian and Russell, 1974). This model suggests that contextual stimuli may affect cognitive and affective states and lead to a specific behavioral response. In the current case, the stimuli are represented by the perceptions of the service environment. These perceptions affect individuals' cognitive and affective responses to the self-service machinery and elicit a specific behavior, SST usage. In addition, this study expands SOR's scope by including the elderly need for human interaction as an intervening variable in the relationship between the cognitive/affective component and the behavioral response. This theoretical framework has already been applied in several studies investigating the banking context (Guan *et al.*, 2021; Sahoo and Pillai, 2017) and elderly cohorts (Lai and Chong, 2020; Seo and Fiore, 2016), proving itself as a valuable theory to analyze the influence of the physical environment and social elements in shaping human behaviors.

3. Methodology

3.1 Settings and sampling procedures

We adopted a multi-stage sampling procedure, where the sample was selected following different steps. First, we chose a specific geographical context. In particular, we focused on the Italian setting since it counts the largest share of people over 60 years old in Europe, and this age group grows at a rate of 1.50% per year (World Data Atlas, 2022), thus fitting well

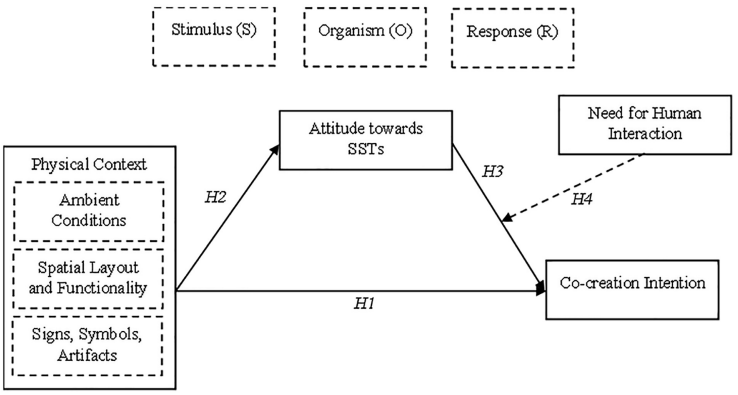

Figure 1.
Conceptual model

with the current research objectives. Second, we selected a large Italian bank where using SSTs was mandatory with potential interactions with an employee in case of necessity. Third, we targeted individuals aged 60 or more with no disabilities. They are generally identified in the literature as "elder customers" (Guido *et al.*, 2022; Shenkin *et al.*, 2017; United Nations, 2019). Fourth, a non-probability homogeneous convenience sampling was adopted to target the research population after processing real-time transactions.

Compared to conventional convenience sampling, the sampling frame for homogeneous convenience sampling is intentionally constrained to a specific sociodemographic background (Jager *et al.*, 2017). In homogeneous convenience sampling, researchers focus on a homogeneous population regarding one or more sociodemographic factors (e.g. the overall population comprises individuals aged 60 or older). The greater the number of sociodemographic determinants, the more homogeneous the sample and the narrower the sampling frame. We used homogeneous convenience sampling since it allowed us to reduce the level of sociodemographic heterogeneity, thus generating a more generalizable sample and decreasing the probability of bias in sampling (Jager *et al.*, 2017). Specifically, after the bank's managers informed the personnel that university researchers would conduct client surveys, customers were reached outside the bank branches by a team of researchers in September–October 2020. A 15-min-long pen-and-paper survey was distributed to them. A total amount of 648 questionnaires were collected. After deleting incomplete responses and outliners, the final sample included 505 individuals. The distribution of the characteristics of the sample, such as gender, age and education level are presented in Table 1.

The survey was edited in Italian and structured according to the literature review. Participants were asked to respond to 19 statements grouped into sections to reflect each dimension of the study: physical context (PHY_CON; 9 items), attitude toward SSTs (ATT_SSTs; 4 items), co-creation intention (CC_INT; 3 items) and need for human interaction (NHI; 3 items). PHY_CON was modeled as a second-order construct formed by three salient factors (ambient condition, AMB; spatial layout and functionality, LAY; and signs, symbols and artifacts, SSA), following the conceptualization originally proposed by Bitner (1992). The measures for these factors were adapted from Dedeoğlu *et al.* (2015). The scale used to assess ATT_SST was adapted from Lien and Cao (2014) and Guan *et al.* (2021), CC_INT from Heidenreich and Handrich (2015), NHI from Taufik and Hanafiah (2019). All items were explained using a seven-point Likert scale, ranging from 1 (absolutely disagree) to 7 (absolutely agree). The analysis was conducted using SPSS 26 (IBM Corp., 2019) and *R* (R Core Team, 2022).

Variables	Frequency	Relative %	Cumulative %
Gender			
Male	274	54.25	54.25
Female	231	45.75	100.00
Age			
60–65	240	47.50	47.50
66–70	224	44.35	91.85
70+	41	8.15	100.00
Education level			
Primary school	232	45.95	45.95
Middle school	142	28.15	74.10
Vocational school	27	5.40	79.50
Secondary school	68	13.50	93.00
University degree	35	7.00	100.00

Table 1. Demographic profile of the sample (*n.* 505)

3.2 Measures reliability

Confirmatory factor analysis using the maximum likelihood method was conducted to establish confidence in the measurement model. The results (χ^2 = 418,041; df = 179; RMSEA = 0.048; CFI = 0.980 TLI = 0.977; NFI = 0.967; SRMR = 0.037) showed an acceptable fit. Internal consistency reliability measured with Cronbach's alpha and construct validity were verified. Common method variance was then tested using the marker variable (MARK) technique. "Willingness to pay for additional safety measures", which is theoretically unrelated to the other constructs used in this study, was used as the marker variable. The results in Tables 2 and 3 demonstrated good internal consistency reliability, convergent and discriminant validities, and the absence of common method variance (Hair *et al.*, 2018).

4. Results

4.1 Moderated mediation results

To test the hypotheses proposed in the theoretical model, we first conducted a multiple moderated mediation analysis using Hayes's (2017) process macro for SPSS (Model 14; 5.000-

Constructs	Measurement items	SFL	CR	AVE
Physical Context (PHY_CON)	Adapted from Dedeoğlu *et al.* (2015)	–	0.875	0.704
	AMB (first-order factor)	*0.959*	*0.889*	*0.729*
	Heating/Cooling is sufficient in the internal spaces of the bank	0.843		
	There is a pleasant smell in the bank	0.803		
	Lighting in the internal spaces of the bank is sufficient	0.912		
	LAY (first-order factor)	*0.727*	*0.947*	*0.857*
	The internal layout of the bank facilitates access to the bank's services	0.932		
	The internal layout of the bank is appropriate for accessing SST	0.942		
	The internal layout of the bank facilitates the fruition of the services	0.903		
	SSA (first-order factor)	*0.814*	*0.955*	*0.875*
	Signs in the bank are sufficiently big	0.929		
	Signs in the bank are easily understandable	0.940		
	Signs in the bank make it easier to find where I want to go	0.937		
Attitude toward SST (ATT_TECH)	Adapted from Guan *et al.* (2021) and Lien and Cao (2014)		0.958	0.851
	I feel comfortable using SSTs	0.895		
	I am satisfied with the services provided via SST	0.925		
	I am happy that the bank provides me with services by SST	0.954		
	I like to use SST in bank business halls	0.914		
Need for Human Interaction (NHI)	Adapted from Taufik and Hanafiah (2019)		0.910	0.772
	I like interacting with a real person that provides the service	0.878		
	Personalized attention by the service employee is important to me	0.943		
	Having human contact in providing services makes the process enjoyable	0.913		
Cocreation Intention (CCI)	Adapted from Heidenreich and Handrich (2015)		0.917	0.786
	I am willing to use SSTs to do my banking operations	0.917		
	I am willing to use SSTs while doing banking transactions frequently	0.937		
	I am willing to recommend the use of SSTs to other customers	0.800		

Table 2.
CFA with factor loadings, AVE, CR and Cronbach's α

Note(s): In italic the reliability indexes and standardized loadings of the Physical-context first-order constructs

Table 3. Mean, standard deviation, correlations, convergent and discriminant validity indexes

	Variables	Mean	SD	α	AVE	CR	1	2	3	4	5	6	7	8
1	Gender	–	–	–	–	–	–							
2	Age	–	–	–	–	–	−0.119	–						
3	Education	–	–	–	–	–	0.048	−0.138	–					
4	MARK	–	–	–	–	–	−0.028	−0.014	−0.014	–				
5	PHY_CON	4.84	1.18	0.937	0.704	0.875	0.094	−0.017	−0.030	−0.046	*0.839*			
6	ATT_SST	4.84	1.75	0.952	0.851	0.958	0.078	−0.182	0.134	−0.035	0.169	*0.931*		
7	CC_INT	5.07	1.13	0.914	0.786	0.917	0.041	−0.005	−0.077	−0.049	0.642	0.211	*0.887*	
8	NHI	5.00	1.24	0.908	0.772	0.910	0.100	−0.072	−0.055	−0.071	0.424	0.161	0.676	*0.878*

Note(s): Diagonal elements (italic) are the square roots of average variance extracted (AVE) by latent constructs from their indicators. Off-diagonal elements are correlations between latent constructs. For convergent and discriminant validity, AVE should be higher than 0.50, composite reliability (CR) should be higher than 0.70, and diagonal elements should be larger than off-diagonal elements in the same row and column

bootstrap sample; 95% bias-corrected confidence intervals). PHY_CON was used as the independent variable, ATT_SST as the mediator, NHI as the moderating variable and CC_INT as the outcome variable. The model testing results reported a significant direct effect of PHY_CON on CC_INT (Coeff. = 0.479; 95% CI 0.417; 0.541; $p < 0.001$), thereby supporting hypothesis H1. Similarly, the direct effect of PHY_CON on ATT_SST was significant (Coeff. = 0.302; 95% CI 0.139; 0.465; $p < 0.001$), as well as the direct effect of ATT_SST on the outcome variable (Coeff. = 0.040; 95% CI 0.010; 0.070; $p < 0.01$). These findings thus lead to the acceptance of H2 and H3. As advanced in H4, the relationship between ATT_SST and CC_INT was significantly moderated by NHI (Coeff. = −0.038; 95% CI −0.063; −0.013; $p < 0.05$). In brief, respondents with high levels of NHI showed a weakened effect of ATT_SST on CC_INT, thus providing support for H4. Table 4 and Figure 2 display the results of the analysis.

To gain more insights into the negative moderating effect of NHI on the relationship between ATT_TECH and CC_INT, a Johnson-Neyman analysis was conducted using the R package Interactions (Long, 2022). As it is displayed in Figure 3, the cut-off value for the NHI score equals 5.79. Simply put, for subjects scoring high on NHI (>5.79), the relationship between ATT_TECH and CC_INT was no longer significant.

Finally, we divided the sample into two sub-samples to highlight if these model relationships become more pronounced with age. The two groups were the 60–65 years old (i.e. young elderly) and the 66+ years old (i.e. older elderly). As a result, the sample was split roughly in half (240 and 265 respondents, respectively), and we tested the theoretical model in each sub-sample. The results remained consistent with the hypothesized relationships, furthermore as age increases, the positive impacts of PHY_CONT and ATT_SST on CC_INT are more prominent, as well as the negative moderating effect of NHI on the ATT_STT-CC_INT relationship. Such results can also assess external validity, thus supporting the generalizability of the findings (Figure 4 and Table 4).

4.2 FsQCA calibration

After symmetrical modeling, FsQCA was conducted to get more insight and investigate further the data, highlighting which configurations of causal antecedents (i.e. ATT_SST and PHY_CON, divided into its components AMB, LAY and SSA) are likely to lead to the presence (or absence) of CC_INT. FsQCA can combine the advantages of qualitative and quantitative research, highlighting the limitations of variable-oriented analysis in comparative social research while stressing its ability to provide measurement precision that case-oriented analysis often lacks. The present study thus adopted fsQCA since it allows a greater focus on the estimation of combinatorial effects of antecedent conditions rather than the estimation of independent net effects, addressing the issues of nonlinear relationship, multicollinearity and contrarian cases (Skarmeas *et al.*, 2016).

Using fsQCA 3.0 software (Ragin and Davey, 2017), we first calibrated and converted all the constructs into fuzzy sets, rescaling the original measures into values ranging from 0 (full non-membership) to 1 (full membership). In the current investigation, factors were directly calibrated using three anchors: full membership, crossover point and full non-membership (Ragin, 2008). Since data were slightly skewed on the right, the full membership threshold was set at the 80th percentile, the full non-membership threshold at the 20th percentile and the crossover point at the mean score of each dimension (Pappas and Woodside, 2021). Table 5 summarizes the calibration process and shows the calibration thresholds and the descriptive statistics of the calibrated causal conditions and outcomes.

The analysis of necessary conditions was then performed to provide insights into the necessity of causal conditions for the outcome (Ragin, 2008). A causal condition or a combination of different causal conditions is necessary if it must be present for a given

Table 4. Multiple moderated mediation analysis

Effects	Coeff.	SE	t	p	LLCI	ULCI
H1: PHY_CONT on CC_INT	0.479	0.031	17.011	<0.001	0.417	0.541
H2: PHY_CONT on ATT_SST	0.302	0.083	3.636	<0.001	0.139	0.465
H3: ATT_SST on CC_INT	0.040	0.015	2.649	<0.01	0.010	0.070
H4: Moderation of NHI on ATT_SST-CC_INT	−0.038	0.012	−2.993	<0.05	−0.063	−0.013

	Young Elderly (age 60–65)						Older Elderly (age 66+)					
	Coeff.	SE	t	p	LLCI	ULCI	Coeff.	SE	t	p	LLCI	ULCI
H1	0.443	0.047	9.304	<0.001	0.349	0.536	0.510	0.052	9.650	<0.001	0.405	0.613
H2	0.191	0.104	1.822	<0.05	0.001	0.097	0.341	0.123	2.772	<0.01	0.098	0.583
H3	0.047	0.022	2.104	<0.05	0.003	0.090	0.086	0.030	2.861	<0.01	0.026	0.145
H4	−0.021	0.027	−1.779	<0.05	−0.074	−0.032	−0.059	0.017	−3.471	<0.001	−0.093	−0.025

Note(s): LLCI = lower-limit confidence interval; ULCI = upper-limit confidence interval

outcome to occur, while it is sufficient if, by itself, it can produce a certain outcome (Ragin, 2008). Hence, a condition, or combination of conditions, is 'almost always necessary' if its consistency score exceeds the threshold of 0.80. However, results highlighted that none of the causal conditions can be considered as "almost always necessary conditions" for the outcomes since consistency scores are below the aforementioned threshold. More details can be found in Table 5.

Sufficiency analysis was thus performed through a truth table to identify the sufficient combinations that may lead to the presence (or absence) of CC_INT. More specifically, since fsQCA permits asymmetrical causal relationships among variables, the combinations of

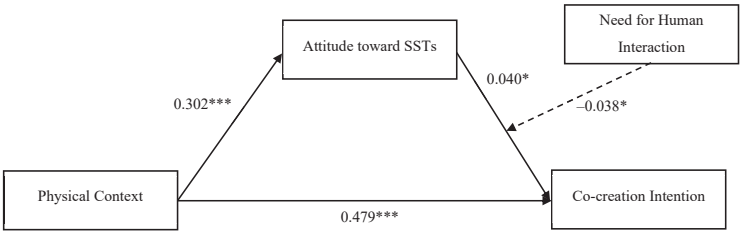

Figure 2.
Estimated model

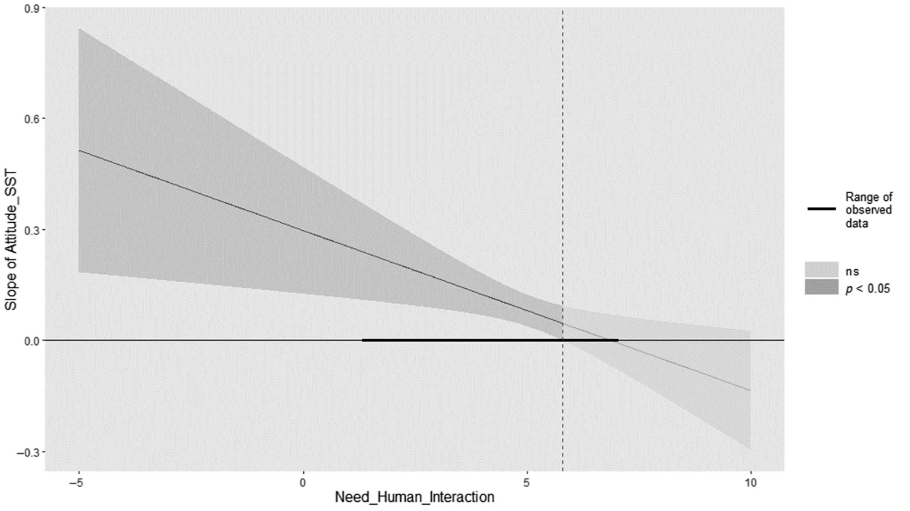

Figure 3.
Johnson–Neyman output for the interaction

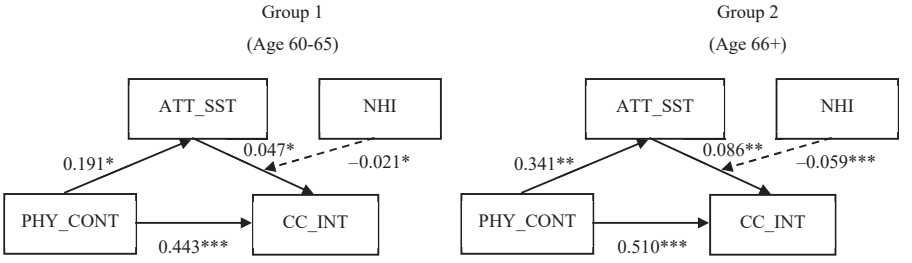

Figure 4.
Estimated model for young elderly (age 60–65) and older elderly (age 66+)

Measures	Calibration thresholds			Descriptive statistics		Necessary conditions CC_INT		Necessary conditions ~ CC_INT	
	Full membership	Crossover point	Full non-membership	M	SD	Consistency	Coverage	Consistency	Coverage
CC_INT	6.00	5.00	4.00	0.56	0.38	–	–	–	–
AMB	6.33	5.33	4.00	0.50	0.39	0.70	0.77	0.42	0.37
LAY	6.00	5.00	3.33	0.49	0.38	0.70	0.81	0.39	0.36
SSA	6.00	5.00	3.67	0.50	0.40	0.69	0.76	0.42	0.37
ATT_SST	6.67	5.00	3.67	0.51	0.39	0.67	0.73	0.47	0.40
~AMB	–	–	–	–	–	0.44	0.48	0.79	0.68
~LAY	–	–	–	–	–	0.43	0.48	0.74	0.66
~SSA	–	–	–	–	–	0.43	0.48	0.73	0.65
~ATT_SST	–	–	–	–	–	0.45	0.52	0.68	0.62

Table 5.
Calibration thresholds, descriptive statistic, and analysis of necessary conditions

causal conditions that explain the presence of the given outcome may be different from those that explain its absence. Hence, we tested for both the presence of CC_INT and its absence (~CC_INT). The two truth tables were refined, considering four as the minimum acceptable frequency and 0.84 as the minimum acceptable level of consistency. Such thresholds align with the recommended levels for large-scale samples (over 150 cases) (Pappas and Woodside, 2021; Ragin, 2008).

4.3 FsQCA results

Table 6 shows the results of the analysis for CC_INT and ~CC_INT. Different configurational sets led to the outcomes, thus providing clear evidence of asymmetric causality and equifinality. The overall consistency was 0.86 for CC_INT and 0.76 for ~ CC_INT, indicating a robust relationship between the outcomes and the causal combinations. The overall coverage, which represents the degree to which the output can be determined based on the proposed configurations and is comparable to the R^2 value for symmetrical methods (Woodside, 2013), was 0.62 and 0.61 for CC_INT and ~CC_INT, respectively, thus suggesting that the causal combinations explained a substantial proportion of the outcomes. Looking at the consistency scores for the different solutions, these ranged from 0.77 to 0.91. Raw and unique coverage represent the empirical relevance of each proposed solution. Raw coverage is the total amount of the outcome explained by a solution, while unique coverage is the amount of the outcome exclusively explained by a configuration (Ragin, 2008). For all the examined configurations, unique coverages were higher than 0, thus highlighting that all the solutions were empirically relevant.

Three configurations were found to be sufficient to explain the presence of CC_INT for elder retail banks' customers. Solutions S1a and S1b, which shared LAY and ATT_SST as core conditions, were neutral permutations in which the peripheral causes surrounded the core conditions without influencing the overall performance of the configuration (Fiss, 2011). In solution S1a, AMB was the peripheral condition, while in S1b, the same role was played by SSA. Finally, in solution S2, AMB, LAY and SSA were all addressed as core conditions. Most notably, S2 showed the highest empirical evidence (raw coverage = 0.55 and unique coverage = 0.15), suggesting that it is the most important configuration leading to CC_INT. As for the single causal conditions, LAY was identified as a core condition for all the proposed solutions, thus demonstrating its relevance in explaining CC_INT. Concerning ~ CC_INT, two sufficient solutions were considered. Solution S3 combined ~ LAY and ~ATT_SST as core conditions, while solution S4 comprised ~ LAY and SSA as core conditions, with ~AMB

	Solutions for CC_INT			Solutions for ~ CC_INT	
Causal antecedents	S_{1a}	S_{1b}	S_2	S_3	S_4
AMB	•		●		⊗
LAY	●	●	●	⊗	⊗
SSA		•	●		●
ATT_SST	●	●		⊗	
Consistency	0.90	0.91	0.89	0.77	0.81
Raw Coverage	0.43	0.44	0.55	0.56	0.26
Unique Coverage	0.03	0.04	0.15	0.35	0.05
Solution coverage		0.62		0.61	
Solution consistency		0.86		0.76	

Table 6.
Results of fsQCA for CC_INT and ~CC_INT

Note(s): ● = presence of a causal condition; ⊗ = absence of a causal condition; large circles = core conditions; small circles = peripheral conditions; blank spaces = irrelevant conditions

as peripheral conditions. More specifically, S3 was the most empirically relevant solution for ~ CC_INT (raw coverage = 0.56 and unique coverage = 0.35), while ~ LAY was the main causal condition leading to the absence of CC_INT (~CC_INT) among retail banks' customers.

5. Discussion and contribution

This study aims to deepen the current understanding of how the physical context of bank retail influences elderlies' attitudes toward SSTs and, in turn, their co-creation intention. The findings suggest that a functional retail space may result in a positive attitude toward SSTs, which increases their co-creation intention. Additionally, results confirm that a high need for human interaction in older customers has detrimental effects on their willingness to co-create via SSTs.

First–discussing the symmetrical model results–the moderated mediation analysis revealed a positive relationship between physical context and co-creation intention, thus, suggesting that a functional and pleasant service environment is connected to a higher willingness to co-create in elderly customers. Second, the physical context was positively related to attitude toward SSTs, indicating that the physical context impacts elders' willingness to co-create and their attitude toward self-service machinery. Third, attitude toward SSTs was positively related to co-creation intention. Accordingly, a positive attitude toward the self-service machinery is significantly associated with elders' willingness to engage in co-creation, yet the magnitude of this effect was small. Finally, the need for human interaction was found to negatively moderate the relationship between attitude toward SSTs and co-creation intention. This result highlights a detrimental effect of the need for interaction with others and the relationship between attitude toward SSTs and co-creation intention. The Johnson–Neyman analysis furtherly confirmed this, emphasizing the friction between the elderly attitude towards the self-service machinery and their need to interact with others. Finally, the magnitudes of all the relationships mentioned above were higher in the older elders. As age increases, the positive impacts of physical context and attitude with SSTs on co-creation intentions are more prominent, as well as the negative effect of the need for human interactions on the attitude-intention relationship. Assessing the effects of age in the two subgroup also increased the external validity of the results as replicating the model across subpopulations composing the sample returned similar results.

As for the fsQCA results, the solution table for co-creation intention presented three configurations. First, in all solutions, the layout was a present and core condition. Moreover, for the absence of co-creation intention, the solution with the highest empirical relevance presented the absence of the layout as a core condition. Second, the most empirically relevant solution for the presence of co-creation intention was S2. Altogether, these results emphasized that designing a pleasant, easy-to-explore, and, most importantly, functional service environment positively affects elderly customers in terms of willingness to co-create. Finally, as for attitude toward SSTs, this causal antecedent was addressed as a core condition in two out of three solutions (S1a and S1b). Nevertheless, these configurations were less empirically relevant than S2. Thus, they may represent elderly customers who are more prone or conscious about service technologies and see them as useful despite their age. However, these two configurations were also characterized by elements related to the physical context.

5.1 Theoretical contributions

In contrast to the major research stream–which focuses mainly on self-service machinery characteristics (Gerrard and Barton Cunningham, 2003; Gong *et al.*, 2022; Kim and Park, 2019; Lee and Lyu, 2019) - this investigation explored the effects of the under-emphasized physical

dimensions and need for human interaction on elder customers co-creation intentions via SSTs. By adopting and operationalizing the SOR framework (Mehrabian and Russell, 1974), this study examined the interrelatedness between some of the major touchpoints of the customer journey – physical environment, technology and human interactions – to shed light on the elements that may influence older customers' willingness to co-create via SSTs. To the best of the authors' knowledge, this is the first research attempt to do so, especially in the elderly cohort. The contributions to the literature are the following.

First, it hints that a well-designed service environment increases elderly customers' attitudes toward SSTs as it helps them overcome the "natural" aversion to self-service machinery. On the one hand, this result enriches the contributions around motives and barriers behind elderly customers' SST usage (Dean, 2008; McPhail and Fogarty, 2004; Pantano *et al.*, 2022; Simon and Usunier, 2007). On the other hand, it adds validity to the findings of previous studies (Guan *et al.*, 2021; Xie *et al.*, 2011) about the positive link between physical context and co-creation intention also among elderly customers. As in other service settings (Almanza *et al.*, 2017; Ann and Koenraad, 2010; Seo and Fiore, 2016), the physical environment shapes elderlies' behaviors inside bank service facilities. Thus, for co-creation to occur, it may not be sufficient to create retail technologies designed for elderly customers (Pantano *et al.*, 2022); it may also be necessary to design service environments that facilitate interactions with service technologies. In sum, it is a matter of integrating the technological resources within the overall service environment in a way that is functional to the fruition of those that, as elderly consumers, have peculiar needs and characteristics.

Second, and by means of fsQCA, the current investigation highlights the spatial layout as a fundamental physical element determining elderly customers' willingness to co-create with SSTs. This dimension captures the accessibility of the service space and emphasizes how much important it is to design accessible service environments for elderly customers. Thus, accessibility to the service machinery is the specific aspect of the service environment on which retailing banks should focus to meet the needs of elderly users and engage them in co-creating behaviors (Ann and Koenraad, 2010; Moye and Giddings, 2002; Pettigrew *et al.*, 2005). In general, these two results indicate that, in the elderly cohort, the use or refusal to use SSTs may also be motivated by environmental settings in which the service technologies are embedded. Thus, the integration between technological and environmental resources may be the proper strategy to prompt co-creation behaviors among elderly customers, not only for retail banks (Lusch and Vargo, 2014; Mele *et al.*, 2022).

Third, this study also highlights the detrimental effect of elders' need for human interaction on the relationship between attitude toward SSTs and their co-creation intention. This result confirms previous knowledge about the friction between technology and the need for interaction with others during service encounters (Collier and Kimes, 2013; Demoulin and Djelassi, 2016; Gelderman *et al.*, 2011; Taufik and Hanafiah, 2019). This effect may be justified by the fact that elders are less confident, more uncertain and less comfortable with technology than other age cohorts (Bianchi, 2021; Lee and Lyu, 2019). In addition, the deprivation of social contact caused by the pandemic – physical distancing, lockdown and changes in service delivery – may have also caused an increase in the social isolation phenomenon that affected the elderly cohort even before the pandemic (Patel and Clark-Ginsberg, 2020). Older customers suffering from a poor social life may have associated great value in their relationships with service employees to fulfill their social needs and emotional support (Pettigrew, 2007; Song *et al.*, 2018). Accordingly, the need for human interaction may also find its roots in satisfying these social needs rather than the assistance older customers need in retail settings (Kim *et al.*, 2005; Myers and Lumbers, 2008). Older customers may indeed perceive technology as useful (Karahasanović *et al.*, 2009); however, they may not use it as it cannot fulfill the non-utilitarian needs that these individuals seek to meet during the fruition of different services. Accordingly, implementing solutions able to satisfy these social needs

may result in higher satisfaction and loyalty in the elderly cohort and a potentially higher level of SSTs adoption and usage.

Finally, this study expands previous theoretical knowledge by adding two novel insights. First, it expands on the study of Pantano *et al.* (2022) on retail technologies. As mentioned above, developing new technologies to support elderly consumers may not be sufficient to ensure actual usage, as even the service environment may act as an excluding factor in this regard. Furthermore, this contribution furthers the knowledge of co-creation antecedents in the elderly segment. Adding in particular to the studies of Bianchi (2021) and Mele *et al.* (2022), this research shifts the focus from the role of the "service assistants" (e.g. service mediators or cognitive assistants) to the role of the service environment in studying co-creation behavior among the elders. In this regard, it highlights that the service environment may be considered a precondition to ensure the elderly proactive behaviors in all self-service settings, not only in retail banks. In sum, the present contribution highlights the importance of rethinking the role of service environments in the age of technology. Increasing the acceptance of technological solutions among elders is also a matter of properly incorporating technology within the service context and fulfilling those non-functional needs that the elders perceive. As there will be no return to pre-pandemic scenarios in service delivery (Meuter, 2022), academics should concentrate on understanding how both the contextual and social elements influence elders' behaviors and, consequently, facilitate or impede specific actions that can be mutually beneficial for both customers and service providers.

5.2 Practical and social contributions

The study has significant implications for managers and practitioners. First, bank service providers should properly design or redesign their physical retail environment to encourage elderly customers' SSTs adoption and interactions. Creating self-service machinery oriented explicitly toward serving the older segments may not be sufficient to ensure their actual usage in the post-pandemic scenario. Instead, retail banks should consider elders' overall "customer journey" inside their branches, especially if they are unwilling to offer human assistance to their clients. This means emphasizing accessibility and creating functional and comfortable layouts, so elderly customers' needs can be met. In more practical terms, considering the spatial elements of the physical context is fundamental for serving the elder cohort efficiently, as the tangible clues of the service environment may be critical attributes in justifying elderly usage or adoption of the main service (e.g. location and accessibility of the service machinery as well as of the main entrances and the emergency exits, wheelchair accessibility, size of the walkways and corridors, proper and comfortable seating, proper signage systems, presence of elevators).

Furthermore, retail banks should be fully aware of the friction between technology use and elder individuals' need for human interaction. Training and deploying *ad hoc* staff that–especially during the early stages of technology implementation–can guide and support elderly customers may facilitate participation in value co-creation. However, elders' unwillingness to adopt technology may also be related to their desire to interact with others. Thus, creating service environments designed to fulfill these needs and focused on delivering pleasant experiences may increase the willingness of elderly customers to play an active role in technology-mediated co-creation processes.

The potential of the grey market is conspicuous for retail banks. However, besides economic evaluations, banks and other service providers will necessarily have to deal with the mutated age pyramid. Western countries are already witnessing the transition towards a much older population structure, and businesses must prepare to respond to the grey tsunami. In this regard, the present contribution endorses the necessity to think about and design age-friendly services, as it will be necessary to accommodate the needs of the growing

segment of elderly users. Finally, thoughtful considerations should be paid to the future. The "new" older consumers will no longer be "digital immigrants" in two decades. Thus, it is plausible that the new elder generation will no longer be skeptical about technology. However, these customers will still suffer from those impairments inevitably bound to aging and the social problems that already affect elders. Elderlies are at high risk of social isolation, and the pandemic has severely increased this risk with negative consequences at individual and societal levels. The life span for this segment of the population has increased since the advances in medicine. Nevertheless, older people's quality of life is still negatively affected by lacking physical environments: a limited understanding of how the tangible features of the surroundings affect elderlies' life is still present. Consequently, a viable long-run strategy to serve this peculiar segment should focus on designing suitable service environments rather than adapting technology to this particular cohort.

6. Limitations and future research

This study exhibits inherent limitations which require discussion. First, the model was empirically tested in a specific country, Italy, renowned for its large share of elderly people. Even though homogeneous convenience samples have clearer generalizability than convenience samples, the current study's findings generalize to a limited population. Hence, we divided the sample into two sub-samples showing that the model relationships become more pronounced with age. Nevertheless, additional data from other countries could increase the reliability of the results. In addition, other cultures or different stages of economic development can potentially affect the banking environment and the use of SSTs, thus necessitating further inquiry. Second, the results of the current study highlight that elderly individuals can have a particular attitude toward SSTs. In this regard, comparing these results with other age groups could represent an interesting area for future research. Third, the present study focused on human interaction as a moderator. Future studies can investigate the effect of other moderating variables such as gender, length of time of SSTs usage and social presence. Other situational factors, such as users' degrees of knowledge and prior experience, can also be added to the conceptual model. Fourth, it is good to specify that, in general, using "self-perceived age", along with the actual demographic age, may deepen the understanding of elderly customers' interaction with SSTs. Finally, future studies could qualitatively investigate the importance of human contact for the elderly. Direct interviews with older people would allow shedding light on the motives of their technology avoidance, specifically understanding if this is more driven by a scarce ability to properly use technological tools – and the related need for assistance – or by a desire for companionship and emotional support.

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Corresponding author
Gioele Zamparo can be contacted at: zamparo.gioele@spes.uniud.it