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Cognitive, demographic, and situational determinants of service customer preference for personnel-in-contact over self-service technology

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Abstract

This study explores the cognitive, demographic, and situational determinants of the preference for using self-service technologies over personnel-in-contact, with a focus on rational-experiential thinking styles [Epstein, S., Pacini, R., Denes-Raj, V., & Heier, H. (1996). Individual differences in intuitive-experiential and analytical-rational thinking styles. *Journal of Personality and Social Psychology*, 71(2), 390-405]. After an exploratory study of how service customers view service complexity, data are collected through a survey based on face-to-face interviews of adults who use seven different services; these data are analyzed using structural equation modeling. Findings show that (1) rational engagement has a strong positive effect on the preference for technology-based self-services; (2) persons high in experiential style prefer interactions with service personnel; (3) differential wait times have a significant influence on preference for technology; (4) service complexity moderates the influence of cognitive styles on preference for service technology; and (5) age has a negative influence on the preference for service technology.

Keywords: Service technology; Cognitive style; Aging; Service complexity; Service encounter

1. Introduction

Researchers recognize the critical importance of technology in the delivery of services, and empirical studies have investigated consumer differences in the use of technology-based self-services (Bitner, Brown, & Meuter, 2000; Dabholkar, 1996, 1994; Dabholkar & Bagozzi, 2002; Meuter, Bitner, Ostrom, & Brown, 2005; Meuter, Ostrom, Roundtree, & Bitner, 2000). Offering technology-based self-services, whether on- or off-site, can result in significant cost savings for companies (Barrett, 1997). As a consequence, many consumers are becoming increasingly familiar with self-service technologies (Burke, 2002). However, some consumers tend to avoid self-service technologies (SST), such as automated teller machines (ATMs) or self-service fuel dispensing, though they have been available for over 30 years and are now at a mature stage (Bateson, 1985; Lee, Lee, & Eastwood, 2003). The present research pertains to the preference of service consumers for personnel-in-contact versus SST and centers on service situations in which both delivery options are established service alternatives. From this perspective, the focus is not on investigating factors that explain the adoption of new service technology, such as self-scanning (Dabholkar, Bobbitt, & Lee, 2003). Rather, this research explores the role of cognitive styles in explaining the preference for using self-service technologies over personnel-in-contact and applies rational–experiential thinking styles (Epstein, Pacini, Denes-Raj, & Heier, 1996) for the first time in a service marketing context to conceptualize the major facets of how consumers process information. Epstein and colleagues' theory summarizes parallel effects related to the need for cognition (Cacioppo & Petty, 1982), as well as the need for interaction (Dabholkar, 1996), that previous research finds relevant or expects to be determinant factors in the use of technology-based self-services (see Dabholkar, 1996; Dabholkar & Bagozzi, 2002; Langeard, Bateson, Lovelock, & Eiglier, 1981).

Additional causal factors affecting the preference for self-service technologies are demographic variables, especially age, waiting time, and service complexity (Shostack, 1987). Service complexity is expected to have a moderating effect in the influence of thinking styles on preference for SST, because higher service complexity is likely to accentuate the role of need for cognition (Cacioppo, Petty, Feinstein, Blair, & Jarvis, 1996) and make self-service technologies less attractive. Thus, we consider seven services that are classified by exploratory research

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into simple services (sending domestic mail, cash withdrawal, car refueling) and complex services (sending international parcels, financial transactions, local rail ticketing, long distance rail ticketing).

Section 2 reviews the literature on SST, cognitive styles, perceived service complexity, demographics, and situational determinants. Section 3 proposes a theoretical model. The research design, as well as measurement issues, is described in Section 4. Section 5 presents and discusses the empirical results of the model, based on confirmatory factor analysis of the scales used and structural equation modeling to test causal linkages between latent constructs. Finally, the last section examines the managerial implications of our findings, their limitations, and directions for future research.

2. Determinants of consumer attitude toward technology-based self-service

Early research related to self-service (Bateson, 1985) makes no systematic distinction between technology-based and labor-intensive services. Langeard and colleagues (1981) show in an experimental study that respondents who did not refuel their own car were less likely to use an ATM and more likely to prefer being served by a bank clerk or choose a traditional full-service restaurant. In contrast, Meuter et al. (2000) argue that avoiding service personnel may be a source of satisfaction and lead to a positive evaluation of SST by some consumers. In addition, Dabholkar (1996) and Dabholkar and Bagozzi (2002, p. 188) find that the need for interaction with a service employee, defined as the "importance of human interaction to the customer in service encounters," has a negative influence on the use of SST.

In the past few years, a considerable body of research has focused on the adoption of customer interface technologies (see Hammond, McWilliam, & Diaz, 1998; Hoffman & Novak, 1996) and service technology innovations (as in Dabholkar, 1994, 1996; Dabholkar & Bagozzi, 2002; Curran & Meuter, 2005; Curran, Meuter, & Surprenant, 2003). This research is grounded in the literature on the adoption of innovations and the technology acceptance model (e.g., the TAM paradigm; Davis, Bagozzi, & Warshaw, 1989; Gatignon & Robertson, 1991; Rogers, 1995). Moreover, it has been shown that pre-adoption behavioral beliefs differ from post-adoption beliefs with regard to information technologies (Karahanna, Straub, & Chervany, 1999).

In this paper, the focus is not on the investigation of attributes of the automated interface that facilitate the adoption of self-service. Instead, the research questions are based on services for which both personnel-in-contact and service technology will remain service options in the future, though innovations are bound to replace former product or service solutions in the long run. Our perspective centers on preferences for rival but stable service alternatives in terms of human contact versus technology.

2.1. Rational-experiential individual thinking styles

The cognitive-experiential self-theory (Epstein, 1991, 1994), hereafter referred to as CEST, proposes that people have two fundamentally different but parallel modes for processing information:

(a) A "rational" system in which the person operates primarily at the conscious level. It is intentional, analytical, verbal, and relatively affect free;[1] and
(b) An "experiential" system that is more automatic, pre-conscious, holistic, and "associanistic," according to the term coined by Epstein (1994). It is also primarily non-verbal and intricately associated with affect.

A basic assumption in CEST is that all human behavior is simultaneously influenced by both systems, with their relative contribution varying according to the situation and the person (Epstein et al., 1996; Pacini & Epstein, 1999). From a situational point of view, CEST predicts that interpersonal interaction relates to the experiential system, whereas reasoning and problem solving mobilize the rational system. People differ in the degree to which they characteristically rely on one system rather than the other, and individual differences are measured with rationality and experientiality scales (Epstein et al., 1996; Pacini & Epstein, 1999). Behavior is a joint function of both modes of processing, in which rationality and experientiality scales are independent (Epstein et al., 1996, p. 395; Pacini & Epstein, 1999).

As such, rational-experiential thinking styles may be expected to be relevant in explaining attitudes toward SST, because consumers anticipate and actually make much mental effort when using it. Difficulties in navigating the interface can be approached by using Green's "cognitive dimensions framework" (Green, 1989; Green & Petre, 1996). It identifies cognitive traps for users, such as hidden links, low visibility of information, system resistance to change initiated by users, cognitive effort required to meet particular goals, or premature choices imposed on users. Our assumption is that SSTs involve more cognitive effort than traditional interactions with service personnel for two basic reasons: (1) customers often experience difficulties in navigating the interface associated with an SST and (2) unique features of face-to-face communication cannot be duplicated in automated service.

In contrast to automated interaction, face-to-face communication allows the transmission of implicit and pragmatic messages that help interpret propositional content (Thomas, 1992). Service representatives can provide their experiences and personal opinions. Non-verbal communication modifies the semantic content of the exchange and helps present information more vividly than written communication (Gabott & Hogg, 2000). Moreover, questions can be asked by consumers to service personnel to avoid elaborative information processing. Answers from service personnel provide feedback to consumers and enable them to verify and fine-tune information that was explicitly stated in the interaction (O'Brien, Shank, Meyers, & Rayner, 1988).

Through narrative processing during engagements with employees, the experiential system combines "concrete exemplars into meaningful wholes by arranging them in a form that

[1] The CEST is partially grounded in the concept of need for cognition (Cacioppo & Petty, 1982; Cacioppo et al., 1996) with regard to the rational thinking style.

provides a model for organizing experience and directing behavior" (Epstein, Denes-Raj, & Pacini, 1995, p. 1125). In contrast, the experiential system does not perform well when the interaction is logical and sequential, as is the case with automated interfaces. In summary, face-to-face communication requires a lower level of cognitive effort than using SST to understand service offers. As a consequence, consumers high in rational engagement are more likely to prefer to engage in the search for structured information involving conscious cognitive tasks, such as those required for SST. Consumers high in experiential style are more likely to rely on service employees (or other customers) to make up their minds about service options and obtain service delivery, rather than use SST.

Hypothesis 1. Individuals high in rational engagement tend to prefer SST over personnel-in-contact. Individuals low in rational engagement tend to prefer personnel-in-contact over SST.

Hypothesis 2. Individuals low in experiential style tend to prefer SST over personnel-in-contact. Individuals high in experiential style tend to prefer personnel-in-contact over SST.

2.2. Perceived service complexity

The impact of perceived service complexity on consumer adoption of self-service technologies has been largely ignored by previous research. Shostack (1987) suggests two dimensions to analyze services: (1) service complexity, defined as the number and intricacy of steps required to perform the service, and (2) service divergence, that is, the degree of freedom allowed in or inherent to a particular sequence of the process. Service complexity and service divergence both increase with the number of service options a company offers its service customers. A service can be more or less complex, irrespective of the way it is distributed, whether through personnel or technology.

To unveil the relevant dimensions of service delivery to customers and their attitudes regarding service complexity, this research started with an exploratory qualitative study based on a convenience sample of 64 adults. The list of themes considered seven services. The interviews were all unstructured and informal, except at the end, when respondents were asked to answer two sets of questions. The first set were questions that measured perceived service complexity related to each service covered by the study (five-point Likert scale). The second set of questions used a dichotomous scale to measure preference for SST over personnel-in-contact when using each of the seven services. Interviewers did not call the question of distribution options to respondents' minds before they asked the second set of questions. This ensured that the evaluation of perceived service complexity by respondents would not influenced by the type of distribution interface (automated versus human).

Qualitative findings reveal that some services involve a significantly higher level of perceived complexity — for example, buying a rail ticket from Berlin to London and trying to understand how to minimize transfers or obtain a reduced fare related to criteria such as age or off-peak hours. Customers have to elaborate complicated thoughts about rates, fares, dates, guarantees, and conditions related to the service to develop a full understanding of the conditional options that service firms offer. On the basis of a content analysis of the responses given by the interviewees, perceived service complexity is defined as the overall perception consumers have of the actual complexity of a particular service.

Interviews also supported that divergence and complexity, according to Shostack (1987), should be considered the two major sources of perceived service complexity. Services were classified into two groups according to their level of complexity. Mean perceived complexity (measured on a five-point Likert scale from simple to complex) is 1.51 for simple services (domestic mail, cash withdrawal, and car refueling) and 2.17 for complex services (financial transactions, sending international parcels, local and long distance rail ticketing), a difference significant at $p<.001$. Moreover, consumer preference for SST over personnel-in-contact when using a particular service is negatively related to its perceived service complexity ($R^2=.64$; $p<.05$).[2]

Our hypothesis is that as perceived service complexity increases, consumers anticipate that using SST requires a higher level of cognitive effort to understand service offers. Consequently, they will tend to disregard the use of automated self-service and prefer interactions with service personnel. Indeed, Garbarino and Edell (1997) show that when different levels of effort are necessary for processing equivalent alternatives, efforts adversely affect the choice of those alternatives that are more difficult to process.

Hypothesis 3. Perceived service complexity has a negative effect on the preference for SST over personnel-in-contact.

Moreover, service complexity is expected to have a moderating effect on relationships between thinking styles and preference for SST over personnel-in-contact. When services are simple, the influence of rational-experiential styles may be attenuated since consumers do not anticipate high levels of cognitive effort in order to understand service offers and use the automated delivery option.

Hypothesis 4. In the case of high service complexity,

(a) the positive relationship between rational engagement and preference for SST versus personnel-in-contact is stronger as compared with low service complexity, and
(b) the negative relationship between experiential style and preference for SST versus personnel-in-contact is stronger as compared with low service complexity.

2.3. Age-related changes in cognition

Researchers find that SST users are younger on average than non-users (Eastlick, 1993; Lee et al., 2003; Mathur & Moschis, 1994; Rogers, Cabrera, Walker, Gilbert, & Fisk, 1996; Stafford, 1996; Meuter et al., 2005; Zeithaml & Gilly, 1987). A paradoxical

[2] Mean scores across these respondents were computed for both preference for technology and perceived service complexity for each of the seven services. Then regression was computed between average preference and average perceived service complexity across the seven services. With only seven data points, the number of degrees of freedom of this regression equation is only 5. It should be considered as having exploratory significance.

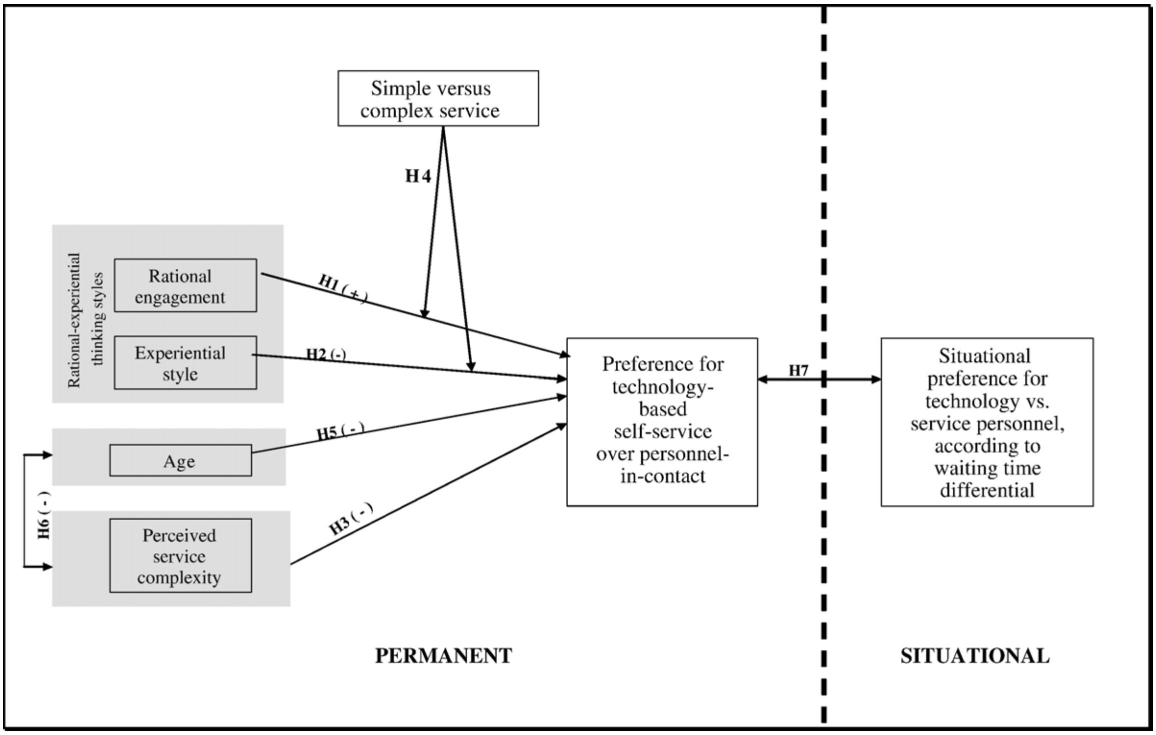

Fig. 1. A model of the preference for technology-based self-service.

outcome of this exploratory research was that perceived service complexity decreases with age (a correlation of −.284, significant at $p<.05$, for the 64 respondents). Aging has a complex effect on cognitive abilities. Mathur and Moschis (1994, p. 35) note that "older people may use credit cards less frequently due to changes in lifestyles and other circumstances associated with age, not age *per se*." Neurobiological research shows that age is associated with a decline in morphological and functional structures, which are key resources for perceptual skills, working memory, processing speed, and the encoding of information into episodic memory (Cabeza, Anderson, Locantore, & McIntosh, 2002; Hedden & Gabrieli, 2004). However, the observation of cognitive performance in older subjects does not show a general decline in coordination capacities when faced with complex cognitive tasks (De Ribeaupierre & Ludwig, 2003). Moreover, verbal and computing skills reach their optimal level between the ages of 30 and 50 years and decline very slowly after 50 years of age (Hedden & Gabrieli, 2004). It seems that qualitative changes based on adaptive strategies, cumulative learning processes, and increased life experience with age may help older people cope better with complex cognitive tasks that involve knowledge when speed is not a key factor (Staudinger, Smith, & Baltes, 1992).[3] As a consequence, age is expected to covary negatively with perceived service complexity.

Hypothesis 5. Age has a negative effect on the preference for SST over personnel-in-contact.

Hypothesis 6. Age is negatively related to perceived service complexity.

2.4. *Impact of differential waiting time on preference for technology*

Waiting time has been shown to be a situational determinant of preference for service technology (Berry, Seiders, & Grewal, 2002; Dabholkar, 1996; Dabholkar & Bagozzi, 2002; Dabholkar et al., 2003). The literature on waiting time in service delivery classically distinguishes between pre-process, in-process, and post-process waiting times (Carmon, Shantikumar, & Carmon, 1995; Dubé-Rioux, Schmitt, & Leclerc, 1988; Hui & Tse, 1996; Leclerc, Schmitt, & Dubé, 1995; Maister, 1985). Dabholkar (1996) shows that speed of delivery by technology interface compared to personnel-in-contact (in-process waiting time), has a direct effect on intentions to use the service for people waiting longer (pre-process). The focus in this research is on pre-process waiting time, which seems the most important situational determinant of preference for service technology. To a large extent, differential in-process waiting time is integrated by service customers in their evaluation of how long they will have to wait.

Hypothesis 7. When waiting time is longer at the window (SST), service customers tend to display a higher situational preference for technology (personnel-in-contact) than their permanent preference.

3. Theoretical model

In the present model, permanent preference for technology-based self-services (Fig. 1) is an attitudinal variable. It reveals

[3] In this research, we are conceptualizing in the context of a non-geriatric population (i.e., below 70 years of age), a choice reflected in the age composition of the study sample.

the general attitude toward SST, that is, "the psychological tendency that is expressed by evaluating a particular entity with some degree of favor or disfavor" (Eagly & Chaiken, 1993, p. 1). Permanent preference for SST can be related to four groups of independent variables: (a) rational and experiential thinking styles, (b) perceived service complexity, (c) age, and (d) a situational influence related to differential waiting time between technology and human interfaces. The rational and experiential thinking styles measure stable individual differences in processing information and are expected to be independent of age. Perceived service complexity is defined as the global perception consumers have of the actual service complexity, which captures both complexity and divergence of service (Shostack, 1987).

4. Research design

The survey was based on face-to-face interviews and carried out by professional interviewers who had been briefed for this research. The population sampled consisted of 115 adults who had used the services surveyed at least twice in the previous 12 months.[4] Interviews took place at service sites, namely, rail stations, post offices, and banks.

4.1. Measurement

The construct of preference for using SST rather than personnel-in-contact was measured by seven dichotomous response items (four items for complex services and three items for simple services; see Table 1). Cronbach's alpha is .70 for the construct of preference for SST for the seven services as a whole, .69 for preference for the four complex services, and a seemingly less reliable .55 for the three simple services (Cronbach, 1990). Jöreskog's Rhô, calculated on the basis of standardized loadings of items in Mplus, is .88 for preference for technology for all services, .88 for complex services, and .80 for simple services. This provides evidence of measurement reliability (Jöreskog & Sörbom, 1979) and enables us to use a summated scale for the dependent variable.

The construct of rational engagement was measured using three items of Epstein et al.'s (1996) rationality scale (five items derived from Cacioppo, Petty, & Kao, 1984; see Table 1). Items with loadings lower than .6 were dropped from further analysis. The scale captures aspects related to rational engagement, defined by Pacini and Epstein (1999) as the reliance on and enjoyment of thinking in a rational (i.e., logical and analytical) manner. Cronbach's alpha is .74 for this construct, and Jöreskog's Rhô is .75.

The construct of experiential style was measured using three items of the five-item faith for intuition scale (Epstein et al., 1996; see Table 1). Factor analysis of the initial five-item scale of faith for intuition showed one strong factor that explained 76.5% of the variance. Two items with measurement errors exhibiting significant correlation with the error terms of other measurement variables were dropped.[5] The three other items capture aspects related to the experiential ability, defined by Pacini and Epstein (1999) as the report of a high level of intuitive ability and reliance on one's own impressions and feelings. Cronbach's alpha is .754 for this construct, and Jöreskog's Rhô is .771.

Measurement of the construct of perceived service complexity is based on local and long-distance rail ticketing and financial transactions. These transactions are assumed to involve a significant level of perceived complexity for consumers, compared with simpler services such as cash withdrawal or fuel distribution.[6] The construct was measured with three items (see Table 1). Cronbach's alpha is .742 for this construct, and Jöreskog's Rho is .788.

To test for the influence of the waiting situation on service preference, a vignette (Alexander & Becker, 1978) was shown to respondents, who had to make a dichotomous decision (0 = going to window; 1 = using SST machine) in three archetypal waiting situations: no wait at both window and machine, longer wait at machine, and longer wait at window (see the Appendix). Situation 1 represents a neutral anchoring scenario. In situations 2 and 3, the differential wait time favors one of the service alternatives. We have computed a first preference shift variable (PrefDW1, more wait at machine) by subtracting the decision in situation 1 from the decision in situation 2, as well as a second preference shift variable based on subtracting the decision in situation 3 from the decision in situation 1 (PrefDW2, more wait at window). There is a covariance link in the model between the two preference shift variables based on differential waits and between each of them and permanent preference.

4.2. Data analysis

Because respondents expressed a dichotomous preference for seven services in terms of personnel-in-contact versus service technology, we had to deal with binary indicators that violate the normality assumption. To deal with these data, two different and complementary routes were chosen. The first route is based on structural equations using AMOS IV, in which the dependent variable is based on summated preferences for technology, four preferences for complex, and three preferences

[4] The sample is relevant for the themes investigated and seeks representativeness in terms of the basic traits of the surveyed population, excluding both the very young and the very old. It is also a heterogeneous sample, as recommended by Calder, Phillips, and Tybout (1981) for this type of research. Specifically, 41% of the respondents were men and 59% women; 12% were between the ages of 18 and 24 years, 15% between 25 and 34, 38% between 35 and 44, 30% between 45 and 60, and 5% older than 60. In addition, 14% were students, 61% belonged to the lower middle class, and 25% belonged to the upper middle and upper class. Their educational backgrounds were primary school (8%), middle school (45%), and some high school up to college (47%).

[5] The measurement error of the first item was correlated with the measurement error of another item in the rational engagement scale. The measurement error of the second experiential style item was correlated with the measurement error of another item in the experiential style scale, as well as with age. This resulted in a very significant worsening of model fit. Modification indices indicated that we should specify covariance links between measurement errors. However, as emphasized by Byrne (2001, p. 110): "Unquestionably, the specification of correlated errors for purposes of achieving a better fit is not an acceptable practice; as with other parameters, such specification must be supported by a strong substantive and or empirical rationale." As a result, we decided to remove these two items.

[6] Sending international parcels was also a good case in point for complex services. However, because virtually all service customers rely on postal personnel for sending international parcels, it lacked discriminating power.

Table 1
Standardized relationships between the constructs and measures (based on Mplus for preference for technology and AMOS 4 for independent variables)

Items ('When I have to [service description], I prefer: (a) using the touch-screen terminal; (b) going to the ticket window')	Estimate	Critical ratio [a]	Convergent validity
Preference for technology (PFT, simple services)			
'Send domestic mail' ⇒ PFT1	1.00		.59
'refuel my car' ⇒ PFT2	.55	3.51	
'withdraw cash' ⇒ PFT3	.68	3.15	
Preference for technology (PFT, complex services)			
'buy a long distance rail ticket' ⇒ PFT4	.93		.66
'send international parcels' ⇒ PFT5	.76	5.85	
'buy a local rail ticket' ⇒ PFT6	.91	6.53	
'carry out financial transactions' ⇒ PFT7	.62	4.88	
Preference for technology (PFT, all services together)			
'Send domestic mail' ⇒ PFT1	.80	6.93	.52
'refuel my car' ⇒ PFT2	.44	3.61	
'withdraw cash' ⇒ PFT3	.57	4.27	
'buy a long distance rail ticket' ⇒ PFT4	.89		
'send international parcels' ⇒ PFT5	.77	6.05	
'buy a local rail ticket' ⇒ PFT6	.83	7.49	
'carry out financial transactions' ⇒ PFT7	.65	5.68	
Constructs/items	**Estimate**	**Critical ratio [a]**	**Convergent validity**
Rational Engagement (RE)			
RE1 'I only think as hard as I have to'	.78		.50
RE2 'I prefer to think about small daily projects to long-term ones'	.63	5.29	
RE3 'I would rather do something that requires little thought than something that is sure to challenge my thinking abilities'	.71	5.52	
Experiential Style (ES)			
ES1 'My initial impressions of people are almost always right'	.48	4.43	.55
ES2 'When it comes to trusting people, I can usually rely on my "gut feelings" '	.93		
ES3 'I can usually feel when a person is right or wrong, even if I can't explain how I know'	.73	5.64	
Perceived Service Complexity (PSC) [b]			
PSC1 'Buying a local rail ticket is simple/complex'	1.00		.58
PSC2 'Carrying out financial transactions such as making deposits, processing withdrawals or making money transfers is simple/complex'	.44	5.29	
PSC3 'Buying a long distance rail ticket is simple/complex'	.73	11.66	

[a] All p-levels <.005.
[b] Perceived service complexity items are scored on a five-point differential semantic scale with the adjectives: *complex, rather complex, neither complex nor simple, rather simple,* and *simple.*

for simple services. It is followed by a bootstrap procedure that makes it possible to assess the robustness of estimates in the presence of multivariate non-normality (Byrne, 2001).

The second route is based first on the identification of latent classes among users of service technology versus personnel-in-contact, followed by structural equation modeling where the outcome variable is latent and represented by binary indicators. It is implemented by using Mplus (Muthen & Muthen, 2004) and polynomial logistic regression, thereby relaxing the assumption of multivariate normality in observed variables. This relaxation allows us to assess the coherence of both treatments (AMOS and Mplus) in terms of model fit and significance of relationships.

5. Empirical findings

5.1. Model estimation based on structural equations

Confirmatory factor analysis based on AMOS was used to check construct validity and verify measurement reliability for preference, cognitive styles, perception of service complexity, and age (see Table 1). The chi-square statistic, root mean square error of approximation (RMSEA), and comparative fit index (CFI) show a good degree of fit for each set of services. The parsimony of the proposed model was confirmed with the values of the normed chi-square falling within the recommended thresholds of 1.0 to 2 for each set of services. All items are significantly related to their construct, supporting the assumed relationships between constructs and their indicators. Convergent validity of individual constructs in the model is confirmed because the mean of the squared factor loadings is equal to or greater than .5 for all latent variables (rhô of convergent validity, see Table 1).

As a test of discriminant validity, the baseline models for simple, complex, and all services were compared to alternative models in which the covariances between pairs of constructs for perceived complexity, rational engagement, and experiential style were constrained to unity (Anderson & Gerbing, 1988). In each case, the constrained model exhibited a statistically significant increase in chi-square value ($p<.000$), providing evidence of discriminant validity between the constructs. Moreover, the average squared correlation between each particular construct and its measurement indicators is greater than the squared correlation with other constructs, providing an additional test of discriminant validity (see Fornell & Larcker, 1981, p. 46).

To test for the non-significance of relationships between exogenous latent constructs not included in the model, we estimated a model that freed the covariances among rational engagement, experiential style, perceived service complexity, and age. The covariances are all non-significant. Finally, a bootstrap procedure was used to check the estimates of parameters in the presence of multivariate, non-normal data.[7]

[7] A bootstrap procedure divides a sample N into n subsamples. Bootstrapped estimates are computed from a set of subsamples, that is, partitions of n individuals of the parent sample obtained by random sampling with replacement (Byrne, 2001). Bootstrapping is used to generate approximate standard errors and confidence intervals for many statistics that AMOS computes. It provides the approximate standard error of standard errors (SE–SE), as well as bias-corrected confidence intervals for each parameter. This process allows us to assess the stability of parameters and report their value with greater accuracy. In this research, 250 usable bootstrap samples are generated. The first point to check in the bootstrap output is whether some bootstrap samples were unused either because of a singular covariance matrix or because a solution was not found. In such a case, it is likely that bootstrapping should not be performed (Arbuckle & Wothke, 1999). In our case, all 250 samples could be used for each of the three models (simple services, complex services, and all services). A significant proportion of bootstrapped samples fit better than the parent sample.

Table 2
Summary of empirical findings (dependent variable: preference for technology versus personnel-in-contact)

	Simple services		Complex services		All services	
	AMOS	Mplus	AMOS	Mplus	AMOS	Mplus
Indicators of model fit						
Probability of chi-square of model fit	.33	.21	.28	.14	.29	.00
Probability of chi-square of model fit (Bollen–Stine)	.55		.51		.53	
Discrepancy/*df*	1.06		1.08		1.08	
CFI (comparative fit index)	.98	.91	.98	.92	.98	.75
TLI (Tucker–Lewis index)	.98	.92	.97	.92	.97	.78
RMSEA (root mean square error of approximation)	.023	.042	.027	.049	.027	.08
(Standardized regression coefficients)						
Age	−.29 ***	−.46 ***	−.30 ***	−.51 ***	−.36 ***	−.61 ***
Perceived service complexity	.24 **	NS	NS	NS	NS	NS
Experiential style	NS	NS	−.31 ***	−.30 **	−.28 ***	−.24 *
Rational engagement	NS	.23 *	.24 **	.53 ***	.24 ***	.37 **
PrefDW1 (preference shift when more wait at machine)	NS	NS	−.27 ***	−.39 *	−.18 *	−.43 *
PrefDW2 (preference shift when more wait at window)	.17 *	.34 *	.25 ***	.34 **	.26 ***	.44 ***
R^2 of preference for self-service technology	.22	.46	.35	.57	.33	.52
Covariation						
Covariance between age and	AMOS	Mplus	Covariance	AMOS	Mplus	
Perceived service complexity	−.18 *	NS	PrefDW1– PrefDW2	.52 ***	.52 ***	

* $p<.1$.
** $p<.05$.
*** $p<.01$.

We systematically checked that bootstrap estimates do not significantly differ from those based on the parent sample alone. A higher *p* value for model fit with the Bollen–Stine bootstrap (Bollen & Stine, 1993) than the *p* value based on the parent sample is an indicator of the stability of model fit. This is the case for each of the three models, with *p* values for the Bollen–Stine bootstrap around .5 (see Table 2).

5.2. Latent class analysis and structural equations with binary indicators

We tested two likely forms of latent classes, one dichotomously opposing service customers who generally prefer personnel-in-contact to those who generally prefer technology. The alternative form builds on three classes: technology fans, personnel lovers, and switchers who decide based on situational cues. With regard to complex services, the dichotomous solution is supported, while the three-class solution is not supported by the data.[8] Neither of the two latent class solutions is supported for simple services. Both the two- and three-class solutions are supported for the seven services together. However, the three-class solution for the seven services together displays a better fit.[9] Analysis of the structural models for the three sets of services used Mplus and considered our dependent variable as a latent construct measured by binary measurement indicators.[10] The results are in line with those found with AMOS, with some exceptions for seven services together (see Table 2). In terms of model fit, both complex and simple services models display satisfactory indicators in terms of chi-square and the associated *p* value, which is not the case for all services together.

5.3. Summary of findings and discussion

Table 2 reports the findings for the three sets of services, based on summated preference on the one hand (AMOS) and latent preference based on dichotomous indicators (Mplus) on the other. Rational engagement and experiential style have the greatest impact on preference for service technology adoption in the case of complex services. They have virtually no influence in the case of simple services, confirming, respectively, H1 and H2 in the case of both complex services and all services.

As expected, rational engagement has a strong positive effect on the preference for using SST for complex services (.24; $p<.01$) and for all services together (.24; $p<.01$). This finding provides evidence that consumers anticipate significant amounts of cognitive effort when using SST, especially for complex

[8] For two classes, the likelihood ratio chi-square of model fit is insignificant ($p<.22$), providing evidence of the existence of separate classes of “technology fans” and “personnel lovers” for complex services, with average latent class probabilities for most likely class membership of 91.4% for technology fans and 94.6% for personnel lovers.

[9] For all seven services together, the average latent class probabilities of the most likely class membership is 95.9% for technology, 96.8% for personnel, and 100% for switchers.

[10] Preference for technology in the case of financial transactions posed a problem of discriminant validity. It loaded quite significantly on the latent construct of preference for technology for complex services; however, the modification indices in Mplus suggested that it was linearly related to both rational engagement and perceived service complexity at greater than the .5 level. We therefore decided not to use it as an indicator of preference for complex services.

services. It may explain the role of perceived ease of use as a major determinant of attitudes toward SST (Dabholkar, 1996; Dabholkar & Bagozzi, 2002). The negative influence of the experiential style on the preference for SST is also confirmed for complex services (−.31; $p<.01$) and for all services together (−.28; $p<.01$). According to Epstein et al. (1996), individuals higher in experiential style are assumed to display high needs for interaction. Our results lend support to this assumption and provide an additional insight into the role of need for interaction in terms of attitude toward self-service, because experiential style plays virtually no role in simple services. For simple services, thinking styles influence preference for technology in the predicted direction, though not significantly, and rational engagement comes close to significance when computed based on latent preferences (.23; $p<.07$).

H3 is not supported by our data; for complex services, perceived service complexity has a non-significant influence on preference for technology (−.12; $p<.20$), though in the predicted direction (negative). When all the seven services are considered, perceived service complexity has no influence on preference for technology (.05; $p<.57$). When service complexity is low, service customers tend to display greater preference for service technology. Langeard et al. (1981) and Bateson (1985) suggest that control is important to customers in using self-services. Research shows that increased perceived control positively affects the evaluation of SST (Dabholkar, 1996; Hoffman & Novak, 1996). It gives customers more command over the process and its outcomes and heightens their preference for technology. This might be especially true when perceived control does not involve a high cognitive cost in terms of service complexity, such as for simple services.

We investigated the moderating effect of service complexity on cognitive styles (H4) by performing chi-square difference tests. The baseline model chi-square for complex services is compared with one in which the path from experiential style to preference for technology is constrained to be equal to the path of the current model for simple services (as for rational engagement). As expected, the constrained model for experiential style is statistically worse at the .05 level than the baseline model ($\Delta\chi^2$ ($df=1$)=3.98). The chi-square difference test for rational engagement does not allow us to identify a significant difference in the coefficients for the two service groups ($\Delta\chi^2$ ($df=1$)=1.82, $p<.18$). Our data only show evidence of a moderating effect of service complexity on the relationship between preference for technology and experiential style, partially confirming H4.

H5 is confirmed for each treatment, as well as for the three sets of services; as expected, age has a strong and direct negative effect on preference for SST over personnel-in-contact. The covariation between age and perceived service complexity suggested by H6 is somewhat supported by the AMOS-based calculation with a standardized coefficient of −.18 ($p<.06$; bootstrapped estimates). However, this finding is not confirmed by calculations based on Mplus, in which the covariation between age and perceived service complexity is not significant. Moreover, it is not possible to conclude that cumulative learning about existing services attenuates the negative effect of age on the preference for using SST.

Past research has often highlighted that younger, better educated, higher income males were on average more likely to use technology-based self-services (Dabholkar et al., 2003; Dickerson & Gentry, 1983; Greco & Fields, 1991; Lee & Lee, 2000; Lockett & Littler, 1997; Meuter et al., 2005; Prendergast & Marr, 1994; Venkatraman, 1991). Conversely, it has been said that due to the increasing access of less educated, less affluent people and their growing familiarity with service technologies, "demographic factors are not of critical interest in understanding why consumers use technology based self-service" (Dabholkar & Bagozzi, 2002, p. 186). Our findings support the view that age has a negative influence on the preference for service technology. However, because gender and education are not significantly related to preference for service technology, the data tend to disregard the stereotypic model of a younger, male, and better educated adopter of self-service technology.

Finally, H7 pertaining to waiting time is supported; the correlation between situational preference shifts and permanent preference are both in the predicted direction and significant, though with a smaller impact in the case of simple services. For all services together and complex services, situational preference shift is correlated with permanent preference for technology in the predicted direction. In the case of simple services, only a longer wait at the window has a slightly significant effect on preference shift for technology (.17; $p<.09$). A tentative explanation may be that service customers expect short in-process time when using technology for simple services and are therefore slightly more sensitive to longer waits at windows. It may also be that waiting differentials between the window and machine must be greater than those presented in the vignette to generate preference shifts in the case of simple services.

6. Implications and limitations

6.1. Managerial implications

Our results show that thinking styles matter less in terms of preferences for SST when the service is less complex. Marketers willing to promote SST should pay closer attention to alternative ways of reducing service complexity. This can imply helping consumers visualize service systems with interactive mapping techniques derived from "blueprinting" (Shostack, 1992) or informing them about process steps and the range of options available. Moreover, search tools could be added to complement the hierarchical structure of ATMs, thereby reducing elaborative information processing for users.

Marketers should ensure the ease of use of their ATMs with careful pretests of the design interface investigating the cognitive dimensions proposed by Green (1989). In addition, service providers should pay more attention to progressive evaluation; that is, they should put more emphasis on enabling users to check their work at any time in the process and help users see at what stage they are. Such support also contributes to decreasing the cognitive load for service customers faced with the limitations of their own immediate memory.

The present research also suggests that service marketers should introduce (or reinforce) relational attributes in the design of automated service interfaces to overcome the natural reluctance of highly experiential consumers to use automated services. This may be based on characters or photographs that show consumers using the service in specific goal-oriented applications, as well as testimonials. In particular, search tools and software agents can be displayed as animated creatures.

Given that service technology is situationally preferred when the waiting differential associated with lines at windows is unfavorable, the supply of automated service machines should be substantial enough that lines at technology interfaces are systematically shorter than those at windows. However, we believe that companies with large bases of elderly consumers should continue to provide human alternatives to SSTs. In-process time, which is less visible for service customers than the pre-process wait, should be advertised as shorter for SSTs, which is most often the case when learning has taken place.

6.2. Limitations and future research directions

Additional research is needed to determine whether the results for the seven service applications covered in the present study generalize to other service technologies and contexts, such as retailing or Internet-based service technologies (e.g., online banking) that involve a mix of technology and personnel-in-contact.

The construct of ease of use of the self-service interface could be included in the model to improve its overall validity, because the influence of rational engagement is intrinsically related to the level of cognitive efforts consumers anticipate. It could be operationalized using the cognitive dimensions in Green's (1989) framework. For theoretical reasons, a positive relation between experiential style and perceived fun can be expected (Epstein, 1994). Indeed, perceived fun has been shown to be a significant determinant of attitude toward using a touch screen for self-service (Dabholkar, 1994; Dabholkar & Bagozzi, 2002). Thus, future experimental research could explore how experiential style is related to perceived "fun" in the use of SSTs.

Future studies could also investigate the underlying dimensions of perceived service complexity, such as actual service complexity and service divergence (as defined by Shostack, 1987). Other promising research avenues deal with the influence of perceptual styles, such as field independence (Witkin, Dyk, Paterson, Goodenough, & Karp, 1962; Witkin, Oltman, Raskin, & Karp, 1971) or verbal/visual processing styles (Childers, Houston, & Heckler, 1985), on perceived service complexity.

7. Conclusion

This research has investigated cognitive, demographic, and situational determinants of consumer preference for SST over personnel-in-contact. The conceptual framework emphasizes the influence of cognitive efforts needed to understand the service and use the technology on preference for SST. This study's findings support the relevance of rational-experiential thinking styles as a significant determinant of preference for SST, particularly in the case of complex services, for which consumers have to engage in effortful information processing. Finally, preference for SST appears quite significantly influenced by waiting time differentials between windows and SSTs, with the consequence that service providers willing to promote SSTs should ensure the wait differential remains in favor of the service technology.

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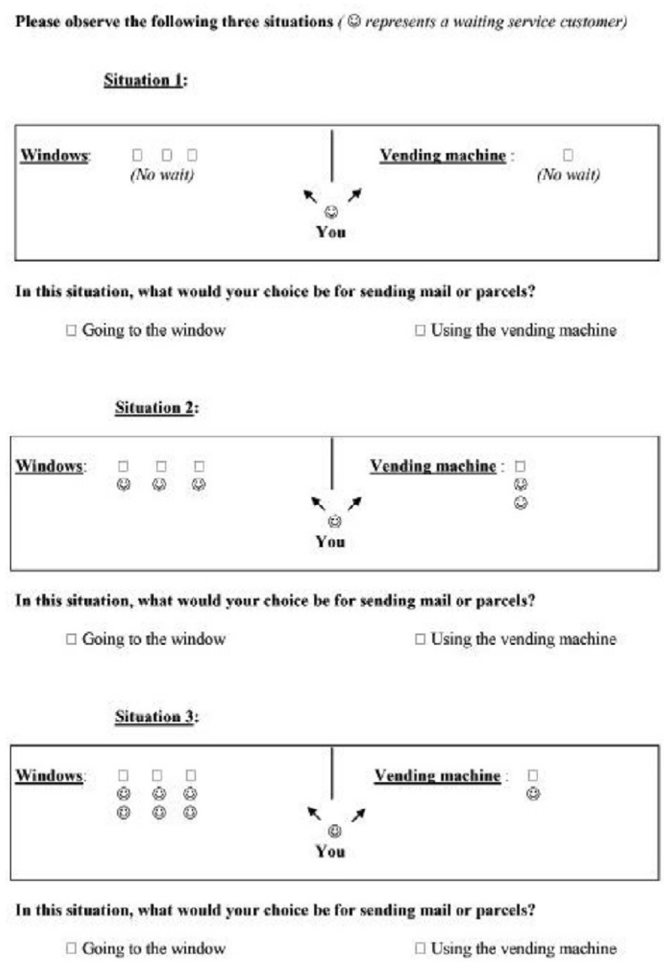
Appendix A. Vignette for differential waiting time



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