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Customer evaluations of after-sales service contact modes: An empirical analysis of national culture's consequences

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Abstract

Technological advances extend the after-sales services portfolio from traditional service encounters to voice- and bit-based services. Technology enables service organizations to transcend geographical as well as cultural boundaries. It might even result in geographical convergence, often treated synonymously with cultural convergence. In this paper, we address this issue. This paper examines the interaction between perceived service performance and national cultural characteristics in the formation of customer satisfaction for three types of after-sales service contact modes. The results suggest that, in contrast to the traditional face-to-face service encounter, the perceived quality–satisfaction relationship is particularly moderated by national culture in the case of an after-sales service contact mode mediated by technology.

Keywords: Service quality; Customer satisfaction; After-sales services; Technology; Culture

1. Introduction

In the past two decades, the notion that offering superior service quality is a key factor in creating a viable competitive advantage has been widely recognized (Zeithaml, 2000). In most service research, the focus has almost exclusively been on face-to-face service interactions, which have been conceptualized as "high-touch, low-tech" (Bitner, Brown, & Meuter, 2000). However, rapid advances in technology are fundamentally changing the nature of service encounters. In addition to traditional face-to-face service contact modes, companies are increasingly making use of voice-to-voice (e.g., toll-free telephone support) and self-serve bit-to-bit (e.g., on-line) service formats. In this way, the concept of competitive service positioning is being expanded and the commonplace wisdom of "listening to the voice of the customer" as well as the long-standing concept of "the customer as partial employee" are finally taking substantive shape.

The emergence of technology in services seems to be evoking a process of spatial convergence. Through technology services now more easily transcend geographical as well as cultural boundaries. Many firms treat such convergence synonymously with cultural convergence. The underlying assumption of this is the inevitability of a worldwide, pan-cultural acceptance

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and positive affirmation of information technology in services. Given the cultural differences that often exist between countries, however, it remains disputable as to whether or not the responsiveness of customers to services and the technologies used is actually culturally neutral. In this paper, we argue that the role of national culture should not be underestimated in the formation of customer evaluations of services. We concur with the view that even in borderless cyberspace "there are very significant borders, such as cultural ones" (Brace, 2000, p. 70). Our main objective is to study the interaction between perceived service quality and national cultural characteristics in the formation of evaluative customer satisfaction judgments for service contact modes with various levels of technology infused. Here, mode of contact is defined as "a specific type of service interaction between an organization and its customer". Due to the increasing use of technology as support for the purchase of goods and their potential to maximize customer satisfaction, our main focus throughout the paper will be on after-sales services.

It is structured as follows. First, in order to establish a conceptual foundation for our research, we provide a brief review of recent literature on service quality and customer satisfaction. Subsequently, we discuss the infusion of technology in services and the role of national culture for services. This discussion leads to the development of hypotheses on the moderating effect of national cultural on the perceived service quality–customer satisfaction relationship for three distinct after-sales service contact modes. Next, we report on the results of a large-scale international study designed to empirically test our hypotheses. We conclude the paper by discussing the theoretical and managerial implications of our findings.

2. Service quality and customer satisfaction: a review

A considerable research effort has focused on services during the past decades. From the focus on the service quality concept in the 1980s (e.g., Parasuraman, Zeithaml, & Berry, 1985), broader conceptual frameworks have been developed to include rival customer evaluative judgments, such as customer satisfaction (e.g., Anderson & Sullivan, 1993; Oliver, 1997). With respect to the relationship between service quality and customer satisfaction, it has been convincingly argued and empirically demonstrated that satisfaction should be viewed as the superordinate construct (Dabholkar, Shepherd, & Thorpe, 2000; de Ruyter, Bloemer, & Peeters, 1997). In other words, there is growing consensus that service quality is an antecedent of satisfaction with services. In addition, the consequences of customer satisfaction following a service episode have increasingly become a topic of investigation. Recently, Bolton (1998) stressed the importance of the link between customer satisfaction and customer retention. Similarly, Bolton and Lemon (1999) found a positive relationship between cumulative satisfaction and usage levels of a service and Bowman and Narayandas (2001) showed that customer satisfaction influences repetitive buying behavior and word-of-mouth activity. Finally, customer satisfaction has also been related to service failure and recovery situations. Smith, Bolton, and Wagner (1999) and Tax, Brown, and Chandrashekaran (1998), for example, demonstrate that positive perceptions of justice or fairness in service recovery contribute to customer satisfaction with complaint handling. In addition, handling complaints satisfactorily will also increase customer commitment and trust (Tax et al., 1998).

Conceptually, service quality and customer satisfaction can be considered to be attitudes. According to Fishbein's 'Multi-Attribute Model of Attitudes' attitudes are being formed by the aggregation of underlying beliefs and evaluations (Fishbein & Ajzen, 1975). In the recent literature on national satisfaction indices, this cumulative view on satisfaction features persistently. Overall satisfaction, theoretically founded by Johnson and Fornell (1991) developed into cumulative satisfaction as a distinction from transaction specific research (Johnson, Anderson, & Fornell, 1995). Researchers across various countries have from then on considered customer satisfaction as a cumulative attitudinal construct (Fornell, 1992; Fornell, Johnson, Anderson, & Cha, 1996; Johnson, Gustafsson, Andreassen, Lervik, & Cha, 2001; Rust, Zahorik, & Keiningham, 1995). In correspondence with the above, in the remainder of the paper we conceptualize overall customer satisfaction as the summated evaluative attitude based on customer perceptions of performance during an after-sales service contact mode.

3. Technology infusion in services

Faced by the challenges of intelligent interactivity, many service providers supplement traditional face-to-face service contact modes with services that involve multiple media. In addition to the personal service encounter, customers can now engage in technology-mediated service interactions. Such applications vary from voice-based services to fully automated self-service aids (Risch Rodie & Schultz Kleine, 2000). The infusion of technology seems to be fundamentally changing the nature of the service encounter with far-reaching consequences for service companies as well as their customers. It has even been argued that the increasingly significant role of technology necessitates a re-conceptualization of established concepts in the existing services marketing research domain. Service encounters, therefore, are now conceptualized as "the dynamic relationship between employees, customers, and technology" (Bitner et al., 2000, p. 141) and have even been classified according to their technology-based delivery mode (Dabholkar, 1994).

The growing implementation of technology in services is not without reason. It offers a wide range of advantages to service providers as well as customers. Increased opportunities for customization, flexibility, recovery, and spontaneous customer delight have been identified as the main drivers of customer satisfaction to be influenced by the infusion of technology (e.g., Bitner et al., 2000). Other frequently mentioned advantages are possibilities to develop multi-channel service strategies, establishing more effective informational exchanges, higher consistency in the delivery of standardized services, lower costs, and an increase in customer choice (Heim & Sinha, 2000).

Several of these advantages have featured prominently in recent service research and are often included in attribute-based conceptual models on service technology evaluations (Dabholkar, 1996; de Ruyter, Wetzels, & Kleijnen, 2001). In addition to outcome-related factors, however, customer evaluations of technology-based services may also depend on the customer's role in the service delivery process (Dabholkar, 2000). In the case of a traditional after-sales service, a service employee might visit the customer, for example, for servicing or repairing a piece of equipment ('do-it-for-me'). The customer's role then remains fairly passive, customer participation will be low to absent and service quality performance will be the main determinant of customer satisfaction. With the advent of technology, however, customers become more and more involved in the service delivery process. Services are now often initiated and delivered by customers themselves, without direct or indirect contact with a service representative ('do-it-yourself') (Barnes, Dunne, & Glynn, 2000). In banking, traveling, brokerage and many other service and goods industries, successful self-service business models have already been developed.

One of the consequences of increased customer participation may be that satisfaction is increasingly based on the customer's attitude towards the technology employed. Attitude-type of variables, such as customer techno-receptivity (Barnes et al., 2000), perceived media richness and symbolism (Treviño, Webster, & Stein, 2000), and the disposition towards self-service technology (Dabholkar, 1996; Meuter, Ostrom, Roundtree, & Bitner, 2000) have already been successfully demonstrated to influence overall service evaluations. These findings are also in line with previous research showing the impact of generalized attitudes on technology evaluations in other contexts (Ledingham, 1984) as well as with studies on social influence and media use (Schmitz & Fulk, 1991). In addition to the main focus on individual-level characteristics of aforementioned studies, it also seems important to take situational context variables into account. The justification for this position is explained in Section 4.

4. Towards a broader perspective on service evaluations: the role of national culture

So far, little is known about the influence of contextual factors on customer evaluations (Parasuraman, 2000). Yet, there seems to be a compelling rationale for taking cultural characteristics into consideration. In the managerial literature, it has been frequently emphasized that the infusion of technology in services is leading to a collapse of temporal and spatial distance (Maney, 1997). Technology facilitates 24/7 service delivery, worldwide, and independent of geographic location. Online presence is often accompanied by offline facilities such as contact centers providing 24-

hour support to customers worldwide, resulting in an advanced convergence of voice and data (Richardson & Marshall, 1999). Furthermore, pan-regional distribution centers for automated, instantaneous ordering and shipping of supplies to clusters of geo-markets have been booming in recent years (e.g., Hewlett-Packard's European service operation). Through these developments, services are increasingly being provided to customers from various cultural backgrounds and culture is becoming a factor to be taken into consideration. Although the ephemera of cyberspace might suggest otherwise, it has been argued that "technology is not independent of culture" (Trillo, 1997). The cultural context, commonly expressed in shared norm and value systems (Hofstede, 1980), has been shown to influence the acceptance of technology-based interactions between people (Trillo, 1997). Likewise, in a business environment increasingly characterized by cultural diversity, divergent identification systems will influence the acceptance and evaluation of technology-based services (Steinman, Deshpandé, & Farley, 2000).

Our predisposition is that cultural contingencies can be expected to influence customer responsiveness to perceived service performance. Gallois and Callan (1997, p. 86) state that all interactions between people are "governed by culture-specific social rules". Furthermore, Usunier (1996, p. 252) reasons that "prevailing cultural norms will apply in service encounters as they apply in any social interaction". Culture, described as a collective value system shared by a category of people (Hofstede, 1991), influences the formation of attitudes and preferences (Lovelock & Yip, 1996) and becomes manifest in non-rational values programmed early in people's lives (Hofstede, 1980). According to Oliver (1997) and Gallois and Callan (1997), such values are predisposing conditions for desires as well as social rules of interaction. As such, they will shape subjective attitudes and preferences and form the basis for comparison standards used by customers to evaluate a service experience. As social networks of customers are expanding beyond their own cultural horizons (e.g., through electronic multi-user groups), customer service expectations and perceptions are increasingly shaped by intercultural connectivity.

Several studies have already empirically examined the role of national culture in services. Donthu and Yoo (1998), for example, found empirical evidence of the effects of cultural traits on service quality expectations. Consumers in low power distance countries, where superiors and subordinates are considered to be more equal, tend to have higher overall service quality expectations and expect service providers to be more responsive and reliable. In support of this, Furrer, Liu, and Sudharshan (2000) conclude that high power distance customers find reliability and responsiveness less important. On the other hand, individualistic consumers were also found to hold higher overall quality expectations, but expect the service provider to be more empathic and assuring (Donthu & Yoo, 1998). Correspondingly, Mattila (1999) reports that customers from different cultures tend to value various service elements differentially. Empirical results concerning national culture and services are not always consistent and univocal, however. Furrer et al. (2000), for example, report on a strong positive relationship between power distance and the relative importance of tangible service elements, thereby contrasting Mattila's (1999) finding. Overall, this leads us to conclude that the theoretical and empirical foundations of national culture's consequences for services are still fluid and that further research on the interrelation between culture and service performance is needed. In order to address this need, we now continue by developing a number of Hypotheses on the moderating role of national culture in customer service evaluations.

5. Development of hypotheses

Cultural variation in attitudes and preferences are likely to evoke different customers responses to perceived service quality. We differentiate between traditional face-to-face after-sales service contact modes on the one hand and technology-based services on the other hand. More specifically, the latter type involves two types of services: voice-to-voice and bit-to-bit after-sales service. As a starting point for the analysis, it is desirable to validate earlier findings. Therefore, on the basis of the aforementioned research, we start by hypothesizing a general positive main effect of perceived after-sales service quality on overall customer satisfaction:

H1. For all three after-sales services (face-to-face, voice-to-voice, and bit-to-bit) there will be a positive

impact of perceived service quality on overall customer satisfaction.

Due to location and time constraints, face-to-face services are commonly delivered by local service employees. Here, a phenomenon that can be referred to as 'cultural adaptation' is likely to occur. Face-to-face encounters are contextually rich enough to adapt to contextual and social cues. They commonly occur within the same cultural context and cultural service adaptation is likely to occur automatically. Consequently, national culture becomes a less influential factor. In contrast, technology-based services are frequently not hindered by location and time constraints and can therefore be delivered across cultural boundaries. It has been argued that in comparison to traditional, face-to-face contact modes, technology-based services entail higher levels of active customer participation or even self-service (Barnes et al., 2000; Bitner et al., 2000; Dabholkar, 2000). Active customer involvement in the service delivery process has been found to positively influence service evaluations (Risch Rodie & Schultz Kleine, 2000). Consequently, we expect that culturally determined norm and value systems will be especially influential for technology-based after-sales service contact modes than for traditional face-to-face services:

H2. For the traditional face-to-face after-sales service, nationalculturaldimensionswillnotmoderatethepositive impact of perceived service quality on overall customer satisfaction.

In contrast to H2, it is expected that for technology-based services, national culture *does* moderate the service quality-overall satisfaction relationship. We will nuance this by making a case for the interaction effects of four cultural dimensions discerned by Hofstede (1980). A distinction was made between four dimensions of national culture: power distance, individualism–collectivism, masculinity–femininity, and uncertainty avoidance. These stable dimensions can be measured relative to other cultures and have been used extensively in previous research. In high power distance cultures, a perceptual distance between powerful and less influential people is expected and sometimes even desired (Hofstede, 1991). Here, people across different power levels do not seem to value close interpersonal contact and are more likely to prefer distant relationships. Interestingly, Furrer et al. (2000) found that customers in such cultures focus more on 'hard' tangible service aspects, rather than on 'soft' service interaction-related dimensions such as reliability and responsiveness of employees. By definition, technology-based services are technology-mediated and as such likely to be perceived as more distant. 'Hard' tangible service characteristics, such as making use of technological aids (telephone, PC, Internet, etc.), can result in increased perceptual distance. Therefore, services where such means are effectively used could be evaluated more positively in high power distance cultures. More specifically, we expect that perceived quality of technology-based after-sales service contact modes will contribute more strongly to overall customer satisfaction in high power distance cultures:

H3. For the technology-based after-sales services, the positive impact of perceived after-sales service quality on overall customer satisfaction will be stronger when national cultural power distance is higher.

Culture is reflected in its members' attitudes and predispositions (Lovelock & Yip, 1996). An important predisposition for adopting and positively evaluating innovative services is the level of innovativeness, i.e., the predisposition to buy new and different products and brands rather than to adhere to earlier choices and patterns of consumption. Countries tend to differ in their pattern of diffusion of innovations (Gatignon, Eliashberg, & Robertson, 1989) and Steenkamp, ter Hofstede, and Wedel (1999) found cultural effects on consumer innovativeness. More specifically, consumers in countries characterized by higher levels of individualism were found to be more innovative. In individualistic cultures initiation of new and unknown behaviors, independently of other persons, seems to be valued more. Persons in individualistic cultures seem to be more trusting and less risk averse in exchange relationships with external, unknown parties (Yamagishi & Yamagishi, 1994). In addition, persons with a lower need for interaction with service employees displayed more positive attitudes towards using new, computerized self-service options (Dabholkar, 1992). It has been argued

that individualists show less interest in interaction and can be bothered less by the social absence of a service provider in the case of technology-based after-sales services (Gallois & Callan, 1997). Therefore, we expect that customers in more individualistic cultures will hold a more positive attitude towards technology-based services and that the individualism dimension will strengthen the service quality–satisfaction relationship:

H4. For the technology-based after-sales services, the positive impact of perceived after-sales service quality on overall customer satisfaction will be stronger when national cultural individualism is higher.

The level of masculinity in a country has also been found to influence consumer innovativeness (Steenkamp et al., 1999). Consumers in countries characterized by higher masculinity are more innovative. This can be explained by the idea that masculine cultures are more material- and achievement-oriented (Hofstede, 1991). Purchasing new items or making use of innovative services can be considered a consequence of this tendency (Mowen, 1995). Furthermore, masculine societies tend to focus less on helping others and will exhibit lower levels of 'service-mindedness' (Hofstede, 1983). Persons in these societies are less likely to feel the need to be served and taken care of in person by a real-life service employee. Consequently, we expect that in more masculine cultures, innovative, non-traditional, and distant after-sales service contact modes will be valued more:

H5. For the technology-based after-sales services, the positive impact of perceived after-sales service quality on overall customer satisfaction will be stronger when national cultural masculinity is higher.

Finally, we reason that due to higher unfamiliarity with innovative, technology-based service contact modes, these services are more likely to be perceived as risky. In accordance with Lynn and Gelb's (1996) finding that penetration of technical durables is lower for higher levels of uncertainty avoidance, the acceptance and utilization of services that strongly rely on technology is likely to be lower in high uncertainty avoidance cultures. Perceived quality of innovative service delivery modes is then less likely to result in additional service satisfaction. As there is less room in technology-based services for contextual cues, which may serve to reduce ambiguity in interactions and stimulate the formation of a positive evaluative satisfaction judgment, we hypothesize that:

H6. For the technology-based after-sales services, the positive impact of perceived after-sales service quality on overall customer satisfaction will be weaker when national cultural uncertainty avoidance is higher.

In Section 6, we discuss the results of an empirical study conducted to test our research hypotheses.

6. An empirical study

6.1. Research design and data collection

The empirical study was conducted with a sample of international customers of a major multinational office equipment manufacturer. For several years, this manufacturer has been conducting a large-scale survey to measure international customer satisfaction with their after-sales service and support operations for its high-tech office equipment. The data focuses on firm-level satisfaction and was collected in 1999 across eleven different countries. These include the Netherlands, the United Kingdom, Norway, Austria, Germany, France, Sweden, Belgium, the United States, Spain, and Ireland.

The face-to-face service format is represented by the traditional service visit. A service engineer then visits the customer's site, for example for servicing or repairing equipment and installing supplies. Typically, a workforce of service engineers within each individual country renders this type of after-sales service. The voice-to-voice service format is call-based and used for solving customer problems from a distance through telephonic contact. Via a semi-automated response system the customer is transferred to a helpdesk where helpdesk agents (qualified service engineers) register and help in solving problems and provide answers to questions. Due to scale of economies reasons these helpdesks usually serve multiple international markets. Finally, the bit-to-bit service format is the contact mode with the highest level of technology involved.

This service type involves the customer-initiated process of ordering necessary supplies like toner, paper, replacements, as well as diagnosing and repairing equipment online. Typically, this occurs through web-based services.

In total, 14,888 questionnaires were sent to customers across the participating countries. Of these, 7657 usable questionnaires were returned, resulting in an effective response rate of 51%. Responses per country were as follows; the Netherlands: 320, the United Kingdom: 736, Norway: 588, Austria: 189, Germany: 477, France: 1167, Sweden: 507, Belgium: 549, the United States: 2666, Spain: 371, and Ireland: 86. Differences in country-level sample sizes reflect the relative size of the markets in each country.

A more detailed profile of our sample emerged on the basis of various background variables: respondents were active in functions such as sales manager (17%), operations manager (42%), company buyer (22%), and general manager (5%). Across all respondents, 88% considered information on the manufacturer's after-sales service levels to be important. Furthermore, from general company records it could be inferred that at the time of the survey 37% of the customers also used other brands of office equipment from other suppliers.

6.2. Questionnaire development

The items used to measure the perceived quality of the after-sales service contact modes were included in a more extensive questionnaire administered for the international customer satisfaction survey. When conducting international surveys, construct equivalence is crucial: underlying meanings and interpretation of items should be equal across countries. For establishing construct equivalence, a four-step procedure was followed. Step one was conducting focus group interviews with managers of local operating companies in order to generate ideas on how to measure perceived quality of the after-sales service contact modes. Although this resulted in self-developed items, the content of these interviews was strongly driven by the dimensions of the SERVQUAL instrument designed by Parasuraman et al. (1985). Next, a preliminary questionnaire was developed by formulating the perceived quality measurement items. It was then double-back translated in each country in order to check translation quality (Brislin, 1980). Third, interviews were held with managers in order to evaluate the questionnaire. On the basis of the comments generated during these interviews, some items were adapted. Finally, a quantitative pretest was conducted with smaller samples of customers, which resulted in some minor adaptations to the final questionnaire.

All perceived service quality items were formulated in an expectancy disconfirmation format in which customers could express their perception of performance relative to their expectations, taking the service of an excellent company in this specific market as the reference point (Cronin & Taylor, 1992). Previous studies found that disconfirmation is an important antecedent of customer satisfaction (Anderson & Sullivan, 1993; Smith et al., 1999). Measurement occurred through a 9-point scale, ranging from 1 (much worse than expected) to 9 (much better than expected). Overall customer satisfaction was measured by a 9-point single-item scale ranging from 1 (very dissatisfied) to 9 (very satisfied). In recent service research, the use of extensive multiple-item measurement instruments has been challenged and even been proven to occasionally aggravate respondent behavior and undermine respondent reliability (Drolet & Morrison, 2001), supporting the use of a single-item scale. The exact wording of our focal variable items is presented in Table 1.

As recommended by Schwartz (1994) and in correspondence with Steenkamp et al. (1999), we opted for representing the national cultural characteristics of the countries participating in the study by updates of Hofstede's (1980) ratings. This is necessitated by contextual changes since Hofstede collected his data in the late sixties and early seventies. In academic research, such updates are quite scarce. However, Hoppe (1990) undertook the effort and provides validated ratings that can be considered more contemporary measurements of national culture. Two remarks are in place here. First, although additional analyses with Hofstede's original scores seem to indicate conclusive equivalence (see Section 7.5), it has been more than a decade since the Hoppe data has been collected. Therefore, further updating might be desirable. Second, a potential drawback of using Hofstede-like ratings might be that they relate to work-related values, which according to Lynn and

Table 1
Measurement items and scale reliabilities

Variable	Item[a]	Reliability (α)[b]
Service Visit Quality (SVQ)	(1) Ability to XXX's service technician to solve your problem in one visit. (2) Degree to which XXX's service technician provides feedback on the progress of the service visit. (3) Competence of XXX's service technician. (4) Understanding of your needs by XXX's service technician. (5) Time taken by XXX's service technician for the repair works. (6) Manner in which XXX's service technicians present themselves.	0.95
Service Call Quality (SCQ)	(1) Competence of XXX's call handling staff in registering your problem. (2) Understanding of your needs by XXX's call handling staff. (3) Feedback on when your problem will be solved. (4) Speed of response by XXX when registering a service call.	0.92
Electronic Service Quality (ESQ)	(1) Accessibility of XXX's electronic service mode. (2) Clarity of the information provided through XXX's electronic service mode. (3) Speed of response of XXX's electronic service mode. (4) Reliability of XXX's electronic service mode.	0.93
Overall Customer Satisfaction (OCS)	(1) Overall, how satisfied are you with XXX's after-sales service?	–

[a] After-sales service quality items: 1 = "much worse than expected", 9 = "much better than expected"; overall customer satisfaction item: 1 = "very dissatisfied", 9 = "very satisfied".
[b] Cronbach's α across international sample.

Gelb (1996) might not equal the values people hold as consumers. Baring these factors and the absence of feasible alternatives in mind, however, we feel quite confident to use them. This is particularly based on the fact that Hofstede's dimensions and Hoppe's updates have been used successfully in more recent consumer-related research (e.g., Lynn, Zinkhan, & Harris, 1993; Roth, 1995; Steenkamp et al., 1999).

It has been found "that parameter differences due to cross-national factors tend to be smaller than differences related to technical characteristics of the model or to product/market specifics" (Farley & Lehmann, 1994, p. 111). In order to take such specifics into account the questionnaire also included an item on whether or not the client firm has bought a digital (i.e., innovative), an analogue (i.e., traditional), or no product from the office equipment manufacturer within the 12 months preceding the survey. With this variable, the level of 'digitalization' versus 'analogization' within companies (individual level) and digital versus analogue product density across countries (country level) can be measured. This variable, which reflects the most important trend in this market, was used for further specification of our empirical model.

7. Data analysis

7.1. Measurement issues

Reliability analyses provided evidence for internal consistency in terms of Cronbach's α (see Table 1). Across the total sample, the α reliability coefficients for service visit, service call, and electronic service delivery were 0.95, 0.92, and 0.93, respectively. All scores well exceed the recommended cut-off value of 0.70 (Nunnally & Bernstein, 1994). Across countries, the coefficients ranged from 0.91 to 0.96 for the service visit, from 0.87 to 0.95 for the service call, and from 0.90 to 0.97 for the electronic service delivery.

Tables 2 and 3 provide insight into variable means, variance structures, and correlations. Table 2 presents the means and standard deviations by country, country scores on the cultural dimensions, and the overall means and standard deviations. The mean structure is

Table 2
Country-level means, standard deviations and national cultural dimension scores

Country	Service Visit Quality (SVQ)	Service Call Quality (SCQ)	Electronic Service Quality (ESQ)	Overall Customer Satisfaction (OCS)	Power Distance (PD)	Individualism (IDV)	Masculinity (MAS)	Uncertainty Avoidance (UA)
Netherlands (NL; $N=320$)	6.10[a] (1.10[b])	6.10 (1.25)	6.19 (1.07)	6.71 (1.28)	38[c]	80	14	53
United Kingdom (UK; $N=736$)	5.96 (1.40)	5.97 (1.56)	6.13 (1.39)	6.30 (1.80)	35	89	66	35
Norway (NO; $N=588$)	5.79 (1.15)	5.63 (1.26)	5.98 (1.11)	6.38 (1.48)	31	69	8	50
Austria (AU; $N=189$)	6.31 (1.64)	6.12 (1.78)	6.67 (1.36)	6.90 (1.81)	11	55	79	70
Germany (GE; $N=477$)	6.08 (1.36)	5.92 (1.60)	6.34 (1.16)	6.61 (1.64)	35	67	66	65
France (FR; $N=1167$)	5.90 (1.32)	5.84 (1.43)	6.00 (1.26)	6.36 (1.46)	68	71	43	86
Sweden (SW; $N=507$)	5.92 (1.29)	5.59 (1.48)	6.46 (1.36)	6.35 (1.62)	31	71	5	29
Belgium (BE; $N=549$)	6.32 (1.29)	6.15 (1.48)	6.54 (1.16)	6.76 (1.48)	65	75	54	94
United States (US; $N=2666$)	6.68 (1.63)	6.62 (1.66)	6.60 (1.44)	6.88 (1.79)	40	91	62	46
Spain (SP; $N=371$)	6.48 (1.57)	5.84 (1.90)	6.74 (1.41)	6.65 (1.73)	57	51	42	86
Ireland (IR; $N=86$)	5.81 (1.65)	5.76 (1.68)	6.00 (1.50)	6.69 (1.68)	28	70	68	35
Overall mean ($N=11$)	6.12	5.96	6.33	6.60	39.91	71.73	46.09	59.00
Overall St. Dev. ($N=11$)	0.29	0.29	0.29	0.22	17.03	12.22	26.20	22.76

[a] Country-level mean.
[b] Country-level standard deviation.
[c] National cultural dimension score.

consistent for 9 out of 11 countries: quality of the after-sales service call consistently scores lowest, the after-sales service visit comes next and the electronic after-sales service is the highest scoring after-sales service type. An inconsistent pattern was found only for the United Kingdom and the United States. Overall, this seems to indicate the absence of methodological biases such as respondents using scales differently across countries.

As can be concluded from Table 3, significant individual- and country-level correlations exist between the perceived service quality variables. This is likely to be caused by the large sample size and the conceptual similarity with respect to the total manu-

Table 3
Variable correlations

Variable	Individual level ($N=7656$)			
	SVQ	SCQ	ESQ	OCS
Service Visit Quality (SVQ)	1.00			
Service Call Quality (SCQ)	0.74**	1.00		
Electronic Service Quality (ESQ)	0.49**	0.51**	1.00	
Overall Customer Satisfaction (OCS)	0.62**	0.60**	0.42**	1.00
	Country level ($N=11$)			
	SVQ	SCQ	ESQ	OCS
Service Visit Quality (SVQ)	1.00			
Service Call Quality (SCQ)	0.79**	1.00		
Electronic Service Quality (ESQ)	0.85**	0.45 (n.s.)[a]	1.00	
Overall Customer Satisfaction (OCS)	0.73*	0.71*	0.60 (n.s.)	1.00
	PD	IDV	MAS	UA
Power Distance (PD)	1.00			
Individualism (IDV)	0.08 (n.s.)	1.00		
Masculinity (MAS)	−0.13 (n.s.)	−0.02 (n.s.)	1.00	
Uncertainty Avoidance (UA)	0.65*	−0.47 (n.s.)	0.19 (n.s.)	1.00

[a] n.s. = not significant.
* Significant at $\alpha=0.05$.
** Significant at $\alpha=0.01$.

facturer's after-sales service. Conceptual equivalence is further strengthened by the items' origin in the validated SERVQUAL instrument. Predictive validity can be inferred from the positive correlations between perceived quality of all three after-sales service types and customer satisfaction. At the individual-level, this effect is significant for all three after-sales service contact modes. At the country-level, it is significant for the after-sales service visit, the after-sales service call, and, although not significant, substantial for the electronic after-sales service. Evidence for predictive and discriminant validity of our single-item satisfaction measure is also present. Although not significant, satisfaction correlates in the expected direction ($r=0.30$) with a reliable customer loyalty measurement instrument ($\alpha=0.66$), consisting of three items (e.g., "I consider XXX to be my first choice for copiers, printers, and plotters") also included in the questionnaire. Finally, the majority of the national cultural dimensions are not significantly correlated, limiting their confounding multi-collinearity effect in our analyses.

7.2. Cross-national equivalence

In cross-national research, the issue of cross-national equivalence needs to be addressed. More specifically, instruments can only be compared when showing cross-national invariance. The underlying reasoning is that cross-national differences in scale means or structural relationships between scale scores then indicate true differences across countries, instead of being caused by systematic response biases or problems with scale artifacts, reliability, or nonequivalence (Mullen, 1995; Steenkamp & Baumgartner, 1998). We tested for measurement invariance using a hierarchical ordering of four nested models. The first model essentially tests whether the pattern of salient and nonsalient factor loadings is equal across countries, also referred to as configural invariance (Steenkamp & Baumgartner, 1998). Our results indicated that the data fit well with the a priori hypothesized model: $\chi^2(814)=1191.91$ ($p<0.001$); GFI = 0.90; TLI = 0.99; CFI = 0.99; RMSEA = 0.031. Although the χ^2-statistic is significant, indicative of a poor fit, the other goodness-of-fit indices indicated a good fit. All factor loadings are significant and the standardized loadings exceeded 0.5. In the second model, we tested whether the factor loadings are equal across countries ($\Lambda^1=\Lambda^2=\cdots=\Lambda^{11}$); this is referred to as metric invariance (Steenkamp & Baumgartner, 1998). Our results indicated that the data fit satisfactorily with the a priori hypothesized model: $\chi^2(924)=1548.89$ ($p<0.001$); GFI = 0.86; TLI = 0.98; CFI = 0.98; RMSEA = 0.038. The increase in chi-square between the two models is significant: $\Delta\chi^2(110)=356.98$ ($p<0.001$). However, the remaining goodness-of-fit indices (TLI, CFI and RMSEA), which are less sensitive to sample size, show a less marked decrease in fit. In the third model, we tested whether the factor loadings, factor correlations and factor variances are invariant across countries.

Our results indicated that the data fit satisfactorily with the a priori hypothesized model: $\Delta\chi^2(984) = 1687.57$ ($p < 0.01$); GFI = 0.85; TLI = 0.98; CFI = 0.98; RMSEA = 0.037. The increase in chi-square between the two models is significant: $\Delta\chi^2(60) = 138.68$ ($p < 0.001$). However, the remaining goodness-of-fit indices (TLI, CFI and RMSEA) show a less substantial decrease in fit. In the fourth and final model, we tested whether the factor loadings, factor correlations, factor variances and error variances are invariant across countries. Our results indicated that the data fit poorly with the a priori hypothesized model: $\Delta\chi^2(1124) = 5703.43$ ($p < 0.01$); GFI = 0.72; TLI = 0.94; CFI = 0.92; RMSEA = 0.098. The increase in chi-square between the two models is highly significant: $\Delta\chi^2(140) = 4015.86$ ($p < 0.001$) and the remaining goodness-of-fit indices (TLI, CFI and RMSEA) also show a substantial reduction in fit. Overall, we find support for configural invariance and partial support for measurement invariance. Our findings suggest that the factor loadings, factor correlations and factor variance are invariant across countries. The error variances are not invariant across countries. However, the invariance of error variances is typically regarded as the least important constraint (Marsh, 1994).

7.3. Multi-level analysis

The analyses include variables at two levels of aggregation: the individual and the country level. Perceptions of service quality and customer satisfaction occur at individual level, whereas cultural characteristics occur at country-level. Such data are designated as multi-level data (Bryk & Raudenbush, 1992; Steenkamp et al., 1999). The levels are hierarchical that customers are nested within countries. How to investigate hierarchically ordered systems has been a concern for a number of disciplines for quite some time. Conventional statistical techniques (e.g., ordinary regression analysis) ignore this hierarchy and, therefore, may lead to incorrect results (Bryk & Raudenbush, 1992). On the contrary, hierarchical linear models, also called multi-level models, are an effective approach to deal with hierarchically nested data structures (Hofmann, 1997; Raudenbush, 1993). Furthermore, a multi-level model allows for the estimation of cross-level effects (i.e., the interactive effects of individual- and country-level variables). This is possible, because the coefficients of the individual-level effects may be specified as random, partially explained by country-level variables.

For conducting the multi-level analyses, the computer program MLwiN 1.0 (Rasbash, Browne, Healy, Cameron, & Charlton, 1999) was employed which computes iterative generalized least squares (IGLS) estimates by means of an iterative approach known as the EM algorithm (Bryk & Raudenbush, 1992).

7.4. Model building

Our model incorporates two levels of aggregation. At the highest level, level 2 contains 11 countries. At level 1, there are 7656 individual customer firms. Level 1 includes three perceived service quality variables and two additional background variables used to provide a further specification of our model: the level of ‘digitization’ versus ‘analogization’. On the other hand, level 2 contains four national culture variables and two background variables measuring the digital and analogue product density across countries.

The actual model building occurred in a stepwise approach. This is shown in Tables 4a and 4b. First, an intercept and background variable-only model (model A) has been estimated. This model decomposes the variance of the intercept and the four background variables into two independent random components, namely σ_{e0}^2 at the individual level and σ_{u0}^2 at the country level. This model represents the remaining unexplained variation of the outcome variable (i.e., overall customer satisfaction) at each level (individual and country). The second model (model B) is an extension: the focal variables under investigation are now included at the individual level to investigate how much of the total variance in the outcome variable can be explained by them. The third model (model C) extends model B by also including the focal variables at the country level. Then model D (Table 4b) is our final model that incorporates the cross-level interactions between the individual- and country-level variables. The analysis of model D occurs in three subsequent steps (model D_1, D_2, and D_3) in order to determine the contribution of cross-level interactions for each after-sales service contact mode individually.

Table 4a
Multi-level analyses results; dependent variable: overall customer satisfaction

	Model A	Model B	Model C
	Fixed part[a]		
Intercept (γ_{00})	6.7550 (0.0711)	6.7441 (0.0702)	5.9933 (0.4040)
Individual-level coefficients[c]			
Digitalization (γ_{10})	− 0.1576 (0.1062)	− 0.0199 (0.0798)	− 0.0198 (0.0798)
Analogization (γ_{20})	0.0027 (0.0613)	0.0682 (0.0460)	0.0683 (0.0460)
Electronic Service Quality (γ_{30})		0.1325 (0.0178)**	0.1325 (0.0177)**
Service Call Quality (γ_{40})		0.3278 (0.0204)**	0.3279 (0.0204)**
Service Visit Quality (γ_{50})		0.4219 (0.0222)**	0.4218 (0.0222)**
Country-level coefficients			
Digital product density (γ_{01})	− 2.0931 (0.7114)**	− 2.1703 (0.7050)**	− 2.4095 (0.9700)**
Analogue product density (γ_{02})	− 0.2414 (0.1745)	− 0.2724 (0.1696)	− 0.3218 (0.1610)*
Power Distance (γ_{03})			− 0.0117 (0.037)**
Individualism (γ_{04})			− 0.0115 (0.0041)**
Masculinity (γ_{05})			0.0018 (0.0019)
Uncertainty Avoidance (γ_{06})			0.0083 (0.0041)*
Cross-level interactions			
Power Distance × Electronic Service (γ_{33})			
Individualism × Electronic Service (γ_{34})			
Masculinity × Electronic Service (γ_{35})			
Uncertainty Avoidance × Electronic Service (γ_{36})			
Power Distance × Service Call (γ_{43})			
Individualism × Service Call (γ_{44})			
Masculinity × Service Call (γ_{45})			
Uncertainty Avoidance × Service Call (γ_{46})			
Power Distance × Service Visit (γ_{53})			
Individualism × Service Visit (γ_{54})			
Masculinity × Service Visit (γ_{55})			
Uncertainty Avoidance × Service Visit (γ_{56})			
	Random part		
σ_{e0}^2 (individual-level variance)	2.6558 (0.0430)	1.4996 (0.0243)	1.4996 (0.0243)
σ_{u0}^2 (country-level variance)	0.0147 (0.0087)	0.0167 (0.0087)	0.0062 (0.0039)
	Model fit		
Deviance	29219.83	24838.60	24830.20
ΔDeviance		4381.23**	8.4
Δ*df*		6	4

[a] Unstandardized regression coefficients presented under models A, B, and C. $N = 7656$. Standard errors between parentheses.
* $p < 0.05$.
** $p < 0.01$.
Note: Test of significance is based on one-tailed test.

7.5. Results

The findings of model A indicate substantial remaining variance at both levels, which implies that a multi-level approach is appropriate. The model fit, the predictive power of the different models, can be compared by a likelihood ratio test (Bryk & Raudenbush, 1992). Deviance is computed for each model and the *difference* between the deviance statistics (ΔDeviance) has a χ^2-distribution under the H0 that

Table 4b
Multi-level analyses results; dependent variable: overall customer satisfaction

	Model D_1 (Step 1)	Model D_2 (Step 2)	Model D_3 (Step 3)	Standard regr. coeff.[a]	Hypothesis
	Fixed part[b]				
Intercept (γ_{00})	5.9897 (0.4036)	5.9884 (0.4036)	5.9888(0.4034)		
Individual-level coefficients					
Digitalization (γ_{10})	−0.0259 (0.0797)	−0.0230 (0.0797)	−0.0221 (0.0798)	−0.0025	
Analogization (γ_{20})	0.0663 (0.0460)	0.0656 (0.0460)	0.0665 (0.0460)	0.2554	
Electronic Service Quality (γ_{30})	0.6241 (0.1785)**	0.4862 (0.1896)**	0.4947 (0.1948)**	0.3386	H1
Service Call Quality (γ_{40})	0.3293 (0.0172)**	0.6831 (0.1559)**	0.7060 (0.1872)**	0.6179	H1
Service Visit Quality (γ_{50})	0.4259 (0.0201)**	0.4305 (0.0180)**	0.3497 (0.2111)*	0.2867	H1
Country-level coefficients					
Digital product density (γ_{01})	−2.3940 (0.9689)**	−2.3967 (0.9687)**	−2.3980 (0.9683)**	−0.0859	
Analogue product density (γ_{02})	−0.3214 (0.1608)*	−0.3211 (0.1607)*	−0.3221 (0.1607)*	−0.0562	
Power Distance (γ_{03})	−0.0117 (0.0037)**	−0.0117 (0.0037)**	−0.0117 (0.0037)**	−0.1008	
Individualism (γ_{04})	−0.0116 (0.0041)**	−0.0116 (0.0041)**	−0.0116 (0.0041)**	−0.0847	
Masculinity (γ_{05})	0.0018 (0.0019)	0.0018 (0.0019)	0.0018 (0.0019)	0.0232	
Uncertainty Avoidance (γ_{06})	0.0083 (0.0041)*	0.0083 (0.0041)*	0.0083 (0.0041)*	0.1040	
Cross-level interactions					
Power Distance × Electronic Service (γ_{33})	0.0067 (0.0022)**	0.0060 (0.0024)**	0.0063 (0.0024)**	0.1938	H3
Individualism × Electronic Service (γ_{34})	0.0073 (0.0022)**	0.0058 (0.0024)**	0.0059 (0.0025)**	0.3267	H4
Masculinity × Electronic Service (γ_{35})	0.0036 (0.0009)**	0.0031 (0.0010)**	0.0031 (0.0010)**	0.1176	H5
Uncertainty Avoidance × Electronic Service (γ_{36})	−0.0068 (0.0019)**	−0.0056 (0.0021)**	−0.0058 (0.0021)**	−0.2344	H6
Power Distance × Service Call (γ_{43})		0.0016 (0.0019)	0.0026 (0.0023)	0.1033	H3
Individualism × Service Call (γ_{44})		0.0038 (0.0019)*	0.0042 (0.0023)*	0.2946	H4
Masculinity × Service Call (γ_{45})		0.0012 (0.0008)	0.0011 (0.0010)	0.0531	H5
Uncertainty Avoidance × Service Call (γ_{46})		−0.0033 (0.0017)*	−0.0038 (0.0021)*	−0.2007	H6
Power Distance × Service Visit (γ_{53})			−0.0020 (0.0026)	−0.0742	H2
Individualism × Service Visit (γ_{54})			−0.0013 (0.0026)	−0.0866	H2
Masculinity × Service Visit (γ_{55})			0.0004 (0.0011)	0.0183	H2
Uncertainty Avoidance × Service Visit (γ_{56})			−0.0010 (0.0023)	−0.0487	H2
	Random part				
σ_{e0}^2 (individual-level variance)	1.4926 (0.0242)	1.4925 (0.0242)	1.4928 (0.0241)		
σ_{u0}^2 (country-level variance)	0.0062 (0.0039)	0.0062 (0.0039)	0.0061 (0.0039)		
	Model fit				
Deviance	24815.43	24808.83	24807.32		
ΔDeviance	14.77**	6.6	1.51		
Δ*df*	4	4	4		

[a] Standardized regression coefficient: coefficient expressed in standard deviations as scale units, given by $\frac{\text{S.D.}(X)}{\text{S.D.}(Y)}\gamma$.

[b] Unstandardized regression coefficients presented under models D_1, D_2, D_3. $N = 7656$. Standard errors between parentheses.

* $p < 0.05$.

** $p < 0.01$.

Note 1: Test of significance is based on one-tailed test.

Note 2: Increase in model fit when steps 1–3 are reversed in building up final model D_3: Step 1 (ΔDev. (4) = 5.11); Step 2 (ΔDev. (4) = 7.68); Step 3 (ΔDev. (4) = 10.09*).

the extended model (model B) does not predict significantly better than the reduced model (model A). Critical values of the χ^2-statistic mean that the reduced model is too simple a description of the data. Model B reveals a highly significant ΔDeviance reflected in the sharp decreases in residual variances of the outcome variable at the individual-level, implying that inclusion of the specified individual-level variables results in a significantly improved model. Regarding model C, the inclusion of the country-level national culture variables does not result in a significant improvement of model fit. However, inclusion of cross-level interactions for the electronic after-sales service in model D_1 (step 1) does result in a significant improvement of the model fit. As can be seen in Table 4b, the coefficients for all four interactions are significant. Adding the interactions for the after-sales service call in step 2 (model D_2) does not significantly improve the model fit. The interaction coefficients for individualism and uncertainty avoidance are still significant, however. Finally, undertaking step 3 (model D_3) of including interactions for the after-sales service visit again does not result in improved model fit and significant interaction coefficients. Clearly, the turning point in the analysis of model D lies in step 2. Although changes in estimated residual variances are slight from model C to model D_3, the significant ΔDeviance resulting from step 1 reveals that this model still is a better specification than model C. Hence, adding the hypothesized cross-level interactions leads to better predictive power of the model.

Although Hoppe (1990) collected updates of Hofstede's (1980) data, it has been more than 10 years since then. In order to develop further insights into time effects that might play a role, we reanalyzed the Hofstede scores on national cultural dimensions. This led to no substantial differences in the results, leading us to conclude that a time span influence is absent. This corresponds with the notion that "society's culture is passed on ('cultivated') by various peer groups (...) from one generation to the next one" (Kotabe & Helsen, 1998, p. 84) and culture tends to be stable over time.

7.6. Hypotheses testing

Our hypotheses were tested by inspecting the significance of the unstandardized regression coefficients for model D_3. Table 4b also shows the standardized coefficients to be used for comparing the fixed coefficients in strength. The results indicate a significant positive main effect for the three individual-level perceived service quality variables on overall customer satisfaction: electronic service quality ($\gamma_{30} = 0.49$), service call quality ($\gamma_{40} = 0.71$), and service visit quality ($\gamma_{50} = 0.35$). Hence, we fail to reject H1; higher levels of perceived service quality increase customer satisfaction for all three after-sales service contact modes.

No significant individual-level effects were found for the extent to which companies purchased digital or analogue products within the last 12 months. However, such effects were found on a country level: countries in which more digital products had been sold throughout the last year showed significantly less customer satisfaction than countries with a lower level of digital product density ($\gamma_{01} = -2.40$). A similar, albeit weaker, effect was found for the level of sales of analogue office equipment ($\gamma_{02} = -0.32$). An explanation for this can be the fact that problems with office equipment generally will show up at early stages in their usage period. Therefore, countries in which, overall, more new equipment from the manufacturer has been bought are more likely to experience problems than countries that predominantly use more established and proven equipment. Due to their innovative nature and the developmental stage of these products, such problems are most likely to occur and have the strongest impact on satisfaction for relatively expensive digital products.

H2–H6 were tested through inspection of the cross-level interaction effects. For the after-sales service visit, none of the four cross-level interaction effects turned out to be significant. Therefore, H2 is supported. With regards to the technology-based after-sales modes, H3 is partially supported: the cross-level interaction between power distance and perceived service call quality is not significant. However, the positive relationship between perceived bit-to-bit electronic service quality and overall customer satisfaction is significantly stronger in countries characterized by higher national power distance ($\gamma_{33} = 0.0063$). Next, national individualism significantly moderates the service quality–customer satisfaction relationship for both technology-based

service contact modes. For service call ($\gamma_{44} = 0.0042$) as well as electronic service ($\gamma_{34} = 0.0059$) perceived service quality has a stronger positive impact on overall customer satisfaction in more individualistic cultures. Therefore, H4 is supported. On the other hand, masculinity significantly moderates the service quality–satisfaction relationship only for the electronic after-sales service ($\gamma_{35} = 0.0031$), not for the service call. Consequently, H5 is partially supported. Finally, both for service call ($\gamma_{46} = -0.0038$) and electronic service ($\gamma_{36} = -0.0058$), a significant moderating effect is found for uncertainty avoidance. In support of H6, the positive relationship between perceived service quality and overall customer satisfaction will be weaker in countries characterized by higher levels of uncertainty avoidance.

Table 5
Service quality synergy effects and non-linear effects

	Model C	Model E	Model F
	Fixed part[a]		
Intercept	5.9933 (0.4040)	6.1060 (0.3979)	6.2102 (0.4217)
Individual-level coefficients			
Digitalization	−0.0198 (0.0798)	−0.0123 (0.0792)	−0.0054 (0.0788)
Analogization	0.0683 (0.0460)	0.0702 (0.0457)	0.0672 (0.0454)
Electronic Service Quality	0.1325 (0.0177)**	0.1479 (0.0147)**	0.0958 (0.0337)**
Service Call Quality	0.3279 (0.0204)**	0.3231 (0.0204)**	0.1674 (0.0346)**
Service Visit Quality	0.4218 (0.0222)**	0.4130 (0.0217)**	0.3981 (0.0346)**
Electronic Service × Service Call		0.0573 (0.0117)**	
Electronic Service × Service Visit		0.0622 (0.0127)**	
Service Call × Service Visit		0.0529 (0.0066)**	
Electronic Service Quality plus square			0.0357 (0.0187)*
Electronic Service Quality min square			−0.0306 (0.0147)*
Service Call Quality plus square			0.0165 (0.0165)
Service Call Quality min square			−0.0861 (0.0098)**
Service Visit Quality plus square			0.0038 (0.0186)
Service Visit Quality min square			−0.0315 (0.0111)**
Country-level coefficients			
Digital product density	−2.4095 (0.9700)**	−2.6696 (0.9532)**	−2.5665 (1.0353)**
Analogue product density	−0.3218 (0.1610)*	−0.3285 (0.1583)*	−0.3400 (0.1686)*
Power Distance	−0.0117 (0.037)**	−0.0117 (0.0036)**	−0.0108 (0.0039)**
Individualism	−0.0115 (0.0041)**	−0.0114 (0.0041)**	−0.0098 (0.0043)*
Masculinity	0.0018 (0.0019)	0.0015 (0.0018)	0.0009 (0.0020)
Uncertainty Avoidance	0.0083 (0.0041)*	0.0077 (0.0040)*	0.0073 (0.0043)*
	Random part		
σ_{e0}^2 (individual-level variance)	1.4996 (0.0243)	1.4716 (0.0253)	1.4532 (0.0253)
σ_{u0}^2 (country-level variance)	0.0062 (0.0039)	0.0059 (0.0038)	0.0072 (0.0044)
	Model fit		
Deviance	24830.20	24712.90	24615.54
ΔDeviance		117.30**	214.66**
Δ*df*		3	6

[a] Unstandardized regression coefficients presented under model C, E and F. $N = 7656$. Standard errors between parentheses.

* $p < 0.05$.

** $p < 0.01$.

Note: Test of significance is based on one-tailed test.

7.7. Model evaluation

In order to substantiate our findings and gain further insight into our data, several additional analyses have been conducted. First, we investigated whether synergies exist from performing well on multiple modes of contact. As can be seen in Table 5 (model E), three interactions between the perceived quality variables were significant and positive. Apparently, the positive main effect of quality for one contact mode is significantly strengthened by the perceived quality of the other modes, which results in an additional increase in overall customer satisfaction.

Secondly, the linearity of relationships between variables was investigated (model F, Table 5). Based

Table 6
Multi-level analysis excluding service visit quality and uncertainty avoidance and split sample analysis

	Model D_3 (full sample)	Model G (without SVQ)	Model H (without UA)	Model I (split sample)
	Fixed part[a]			
Intercept	5.9888(0.4034)	5.8756 (0.4043)	6.5292 (0.2189)	5.7926 (0.4326)
Individual-level coefficients				
Digitalization	− 0.0221 (0.0798)	− 0.0012 (0.0837)	− 0.0298 (0.0786)	− 0.0222 (0.1132)
Analogization	0.0665 (0.0460)	0.0446 (0.0483)	0.0561 (0.0455)	0.1170 (0.0666)*
Electronic Service Quality	0.4947 (0.1948)**	0.6465 (0.1996)**	0.3143 (0.1148)**	0.4949 (0.2779)*
Service Call Quality	0.7060 (0.1872)**	0.9206 (0.1966)**	0.5645 (0.1096)**	0.7897 (0.2678)**
Service Visit Quality	0.3497 (0.2111)*		0.2606 (0.1208)*	0.5215 (0.3051)*
Country-level coefficients				
Digital product density	− 2.3980 (0.9683)**	− 2.4170 (0.9587)**	− 3.2132 (0.8643)**	− 2.3974 (0.9480)**
Analogue product density	− 0.3221 (0.1607)*	− 0.2853 (0.1603)*	− 0.2365 (0.1454)	− 0.4482 (0.1698)**
Power Distance	− 0.0117 (0.0037)**	− 0.0126 (0.0037)**	− 0.0040 (0.0028)	− 0.0103 (0.0040)**
Individualism	− 0.0116 (0.0041)**	− 0.0130 (0.0041)**	− 0.0067 (0.0032)*	− 0.0133 (0.0043)**
Masculinity	0.0018 (0.0019)	0.0020 (0.0018)	0.0017 (0.0020)	0.0023 (0.0019)
Uncertainty Avoidance	0.0083 (0.0041)*	0.0091 (0.0041)*		0.0087 (0.0043)*
Cross-level interactions				
Power Distance × Electronic Service	0.0063 (0.0024)**	0.0059 (0.0025)**	0.0021 (0.0011)*	0.0094 (0.0024)**
Individualism × Electronic Service	0.0059 (0.0025)**	0.0066 (0.0025)**	0.0024 (0.0013)*	0.0072 (0.0035)*
Masculinity × Electronic Service	0.0031 (0.0010)**	0.0031 (0.0011)**	0.0020 (0.0008)**	0.0040 (0.0015)**
Uncertainty Avoidance × Electronic Service	− 0.0058 (0.0021)**	− 0.0058 (0.0022)**		− 0.0069 (0.0031)*
Power Distance × Service Call	0.0026 (0.0023)	0.0028 (0.0023)	0.0018 (0.0011)	0.0045 (0.0033)
Individualism × Service Call	0.0042 (0.0023)*	0.0042 (0.0024)*	0.0024 (0.0013)*	0.0056 (0.0033)*
Masculinity × Service Call	0.0011 (0.0010)	0.0021 (0.0010)*	0.0004 (0.0007)	0.0016 (0.0014)
Uncertainty Avoidance × Service Call	− 0.0038 (0.0021)*	− 0.0042 (0.0021)*		− 0.0057 (0.0030)*
Power Distance × Service Visit	− 0.0020 (0.0026)		− 0.00001 (0.0012)	− 0.0036 (0.0036)
Individualism × Service Visit	− 0.0013 (0.0026)		− 0.0021 (0.0014)	− 0.0003 (0.0037)
Masculinity × Service Visit	0.0004 (0.0011)		0.0004 (0.0008)	0.0004 (0.0016)
Uncertainty Avoidance × Service Visit	− 0.0010 (0.0023)			− 0.0008 (0.0033)
	Random part			
σ_{e0}^2 (individual-level variance)	1.4928 (0.0241)	0.0057 (0.0038)	0.0096 (0.0055)	1.4928 (0.0241)
σ_{u0}^2 (country-level variance)	0.0061 (0.0039)	1.6442 (0.0266)	1.4939 (0.0242)	0.0061 (0.0039)

[a] Unstandardized regression coefficients presented under model D_3, G, H, and I. N(full sample) = 7656; N(split sample) = 3828. Standard errors between parentheses.

* $p < 0.05$.

** $p < 0.01$.

Note: Test of significance is based on one-tailed test.

on Seber and Wild (1989) and Snijders and Bosker (1999), we specified quadratic functions for the perceived service quality variables following a so-called spline function. Adding the functions resulted in a significant decrease of the deviance indicating the occurrence of nonlinear effects, while the coefficients of the main effects for the perceived service quality variables remain significant. With respect to electronic service quality, the coefficient of the squared positive values is positively significant, whereas the coefficient of the squared negative values shows a negative effect. In other words, the effect of electronic service

Table 7
Simulation analyses

	Model J	Model K	Model L	Model M
	Fixed part[a]			
Intercept	6.0766 (0.7664)	5.9243 (0.6678)	6.0024 (0.6588)	5.9281 (0.6439)
Individual-level coefficients				
Digitalization	− 0.0224 (0.0801)	− 0.0154 (0.0422)	− 0.0196 (0.0647)	− 0.0170 (0.0479)
Analogization	0.0664 (0.0462)	0.0696 (0.0479)	0.0665 (0.0456)	0.0683 (0.0450)
Electronic Service Quality	0.4949 (0.1959)**	0.5253 (0.2069)**	0.4926 (0.1870)**	0.5199 (0.1996)**
Service Call Quality	0.7057 (0.1866)**	0.6846 (0.1600)**	0.7104 (0.1897)**	0.6785 (0.1587)**
Service Visit Quality	0.3488 (0.2104)*	0.3542 (0.1610)*	0.3533 (0.2040)*	0.3644 (0.1735)*
Country-level coefficients				
Digital product density	− 2.6029 (2.06)	− 2.5062 (1.8208)	− 2.4659 (1.8481)	− 2.4481 (1.6176)
Analogue product density	− 0.3120 (0.3166)	− 0.3154 (0.2606)	− 0.3106 (0.2265)	− 0.3218 (0.2702)
Power Distance	− 0.0117 (0.0070)*	− 0.0115 (0.0059)*	− 0.0114 (0.0056)*	− 0.0118 (0.0063)*
Individualism	− 0.0108 (0.0081)	− 0.0125 (0.0089)	− 0.0115 (0.0066)*	− 0.0123 (0.0085)
Masculinity	0.0017 (0.0039)	0.0018 (0.0027)	0.0018 (0.0034)	0.0018 (0.0028)
Uncertainty Avoidance	0.0078 (0.0074)	0.0082 (0.0062)	0.0081 (0.0059)	0.0086 (0.0069)
Cross-level interactions				
Power Distance × Electronic Service	0.0063 (0.0024)**	0.0065 (0.0023)**	0.0063 (0.0023)**	0.0065 (0.0022)**
Individualism × Electronic Service	0.0059 (0.0025)**	0.0062 (0.0026)**	0.0058 (0.0023)**	0.0062 (0.0025)**
Masculinity × Electronic Service	0.0031 (0.0010)**	0.0031 (0.0013)**	0.0031 (0.0010)**	0.0031 (0.0013)**
Uncertainty Avoidance × Electronic Service	− 0.0058 (0.0022)**	− 0.0060 (0.0021)**	− 0.0058 (0.0021)*	− 0.0060 (0.0021)**
Power Distance × Service Call	0.0026 (0.0023)	0.0027 (0.0025)	0.0025 (0.0024)	0.0027 (0.0026)
Individualism × Service Call	0.0042 (0.0023)*	0.0040 (0.0021)*	0.0042 (0.0025)*	0.0039 (0.0020)*
Masculinity × Service Call	0.0011 (0.0010)	0.0011 (0.0010)	0.0011 (0.0012)	0.0010 (0.0009)
Uncertainty Avoidance × Service Call	− 0.0038 (0.0021)*	− 0.0037 (0.0018)*	− 0.0038 (0.0021)*	− 0.0036 (0.0019)*
Power Distance × Service Visit	− 0.0020 (0.0026)	− 0.0021 (0.0026)	− 0.0019 (0.0024)	− 0.0021 (0.0027)
Individualism × Service Visit	− 0.0013 (0.0026)	− 0.0013 (0.0021)	− 0.0012 (0.0025)	− 0.0011 (0.0018)
Masculinity × Service Visit	0.0004 (0.0011)	0.0004 (0.0010)	0.0004 (0.0011)	0.0004 (0.0012)
Uncertainty Avoidance × Service Visit	− 0.0010 (0.0023)	− 0.0010 (0.0018)	− 0.0009 (0.0020)	− 0.0009 (0.0017)
	Random part			
σ_{e0}^2 (individual-level variance)	0.0366 (0.0425)	0.0205 (0.0256)	0.0222 (0.0262)	0.0203 (0.0264)
σ_{u0}^2 (country-level variance)	1.4969 (0.02430)	1.4984 (0.0234)	1.4979 (0.0253)	1.4975 (0.0235)

[a] Unstandardized regression coefficients presented under model J, K, L, and M. $N = 7656$. Standard errors between parentheses.

* $p < 0.05$.

** $p < 0.01$.

Note: Test of significance is based on one-tailed test.

Model J: Gibbs-sampling (15,000 iterations).

Model K: 100∗5, bias corrected estimates – scaled S.E., current population starting values.

Model L: 1000∗5, bias corrected estimates – scaled S.E., current population starting values.

Model M: 100∗5, bias corrected estimates – scaled S.E., OLS starting values.

quality on overall satisfaction concerns an increasing function, with a steeper line for lower and higher values of perceived electronic service quality. With respect to perceived service call and service visit quality the results show that the coefficients of the squared negative values of both service modes are also negatively significant, whereas the coefficients of the squared positive values of the service modes showed no significant effect. Consequently, the effect of perceived service call and service visit quality on overall satisfaction concerns an increasing function, with a stronger increase for lower perceived quality values.

Third, in order to investigate if the results are sensitive to correlations between the independent variables (see Table 3), we estimated two additional models; one without perceived service visit quality and one without uncertainty avoidance. The results are presented in Table 6 under model G and model H. Exclusion of both variables did not lead to substantial changes in the results, except for the analogue product density variable at the country level, which became insignificant when uncertainty avoidance is excluded from the analysis.

A final issue relates to the seemingly small magnitudes and thus managerial relevance of the interaction parameter estimates in model D_3. One could wonder if the significance of the estimated coefficients is sensitive to the magnitude of the sample size. In order to check this, we randomly selected 50% of the sample to test the model on. Parameter estimates based on this sample ($N = 3828$, see model I) were found to be similar to those of final model D_3 and all remained significant. This indicates that the results are not being caused by our large sample size. It should even be noted that in two-stage sampling designs the clustering of the data must be taken into account leading to a necessity of using a larger sample to test multi-level models on. In addition, we conducted replicate simulation analyses to test the accuracy and stability of parameter estimates. The results are presented in Table 7. The parameter values obtained through the different simulations were fairly similar to the values obtained via our original IGLS procedure. There were only slight differences in the parameter values when we changed the starting values or the number of replications. The consistency in findings obtained and the apparent insensitivity to the estimation methods provide additional support for their managerial relevance.

8. Conclusion

8.1. Discussion

In this paper, we examined the moderating effect of national culture on the perceived service quality–customer satisfaction relationship for three after-sales service contact modes. The results confirm that the use of technology is indeed not independent of culture and warn against overemphasizing similarities between cultures when providing services internationally. Recent work in communications research (e.g., Carlson & Zmud, 1999) suggesting that people tend to differ in their perceptions of technology-based interactions and that contextual factors may influence the evaluation of mediated communication seems to be in line with our research. Overall, our results are consistent with the cultural adaptation argument, that some of the adaptation occurring in person can also occur over the phone, but less likely via electronic modes of service delivery.

More specifically, for the traditional face-to-face service contact mode, the service visit, no moderating effect of national culture was found. This finding may be explained in two ways. First, due to lower active participation in the service delivery process, the cultural background of a customer and subjective cultural-determined values are less likely to play a role. Consequently, satisfaction with the after-sales service will be foremost determined by the service engineer's performance. A second explanation may stem from the 'cultural adaptation' phenomenon through which traditional service contexts are adapted to contextual and social cues. This will also result in a minimization of national cultural effects.

For service contact modes with a higher level of technology infused and with higher customer participation in the service delivery process, a customer's cultural background does seem to matter. In the case of a voice-to-voice, call-center-based contact mode, it was found that national individualism and uncertainty avoidance significantly moderate the service quality–customer satisfaction relationship. Customers in individualistic cultures seem to be more innovation-

minded and less bothered by the physical absence of a service provider. Here, adequate service quality will be valued more, which results in more positive overall customer satisfaction judgments. However, a negative moderating effect was found for uncertainty avoidance. Higher perceived risk for telephone-based services indeed weakens the positive relationship between perceived service quality and customer satisfaction in cultures where uncertainty avoidance is higher. For the service call, no significant moderating effects were found for the power distance and masculinity dimension. In voice-based services, personal interaction between customers and service employees is still likely to occur, which leaves room for cultural adaptation. During telephone interactions an 'act (i.e., speak) local' strategy may be used by employing native speakers with a similar cultural background. Furthermore, customers may be more used to using the telephone for receiving after-sales services and less aware of the technology (such as computer–telephone integration (CTI)) involved. This will lead to a perception of participating in a less innovative and less distant service, thereby lowering the impact of power distance and masculinity.

The most pronounced effects of national culture were found for the electronic service contact mode. Here, all four cultural dimensions moderate the perceived service quality–customer satisfaction relationship. In national cultures characterized by higher power distance, individualism and masculinity, the positive relationship between quality and satisfaction, is significantly stronger. The distance created by technology seems to be reflected in the distance in power structures. Furthermore, people in individualistic cultures tend to be more innovative and trusting in exchange relationships with external parties. In addition, customers in more masculine cultures seem to value electronic services more. They will more easily use technology-based services and appreciate good technology-based service quality. All this contributes to the formation of a positive satisfaction judgment for high-quality electronic service contact modes. Uncertainty avoidance, on the other hand, weakens the positive relationship between perceived service quality and overall customer satisfaction. In high uncertainty avoidance cultures, high quality of an electronic after-sales service contact mode does not seem to be valued additionally, most likely due to the higher level of uncertainty and perceived risk involved.

8.2. Managerial implications

In an era of increased service globalization our results can be used for designing more effective after-sales support organizations. Increased customer participation in the service process through the infusion of technology seems to go hand in hand with a need for adapting the channels through which services are provided. Compared to the traditional face-to-face after-sales service contact modes, national cultural characteristics are most influential for highly innovative after-sales services. Service firms that plan to centralize their after-sales service delivery systems, for example through the creation of pan-national customer contact centers, need to acknowledge the effectiveness and sometimes even the necessity of a service adaptation approach. For the adaptation of services, explicit attention should be paid to aspects pertaining to the local environment. Cultural characteristics will partly determine the design of effective after-sales service contact modes. More specifically, through user-centered designs that emphasize culture-determined cognitions, values and attitudes, multicultural user bases could be served and cultural distances overcome. Intelligent service agents, designed to act like humans for collecting information, requesting services or handling e-mail, need to 'understand' the cultural background of its users in order to be effective. In high uncertainty avoidance cultures, for example, a technology-infused after-sales service design should be different from that in low uncertainty avoidance cultures. The uncertainty frequently associated with such services could be reduced by providing guarantees, priority responses, service evidence in the form of progress reports and the opportunity to establish personal contact with a service provider (Bitner et al., 2000). In addition, customers in low power distance and collectivistic cultures would have to be approached in a different way than high power distance, individualistic customers. Our results suggest that when people tend to be less innovative, more risk-averse, and value personal contact, an emphasis on personalized after-sales service delivery will be most effective. Implementing an option to contact a service representative 'online' may already be suffi-

cient. In sum, in the planning and design of multichannel service systems, national culture's consequences should be taken into account.

8.3. Theoretical implications

Our study has a number of theoretical implications that merit future research. In the first place, we need to take the existence of the so-called technology paradoxes into account (Mick & Fournier, 1998). These relate to the fact that technology may lead customers to feel competent and in control in relation to acquiring a service outcome. However, at the same time in case the technology fails in the service process, it may result in a sense of incompetence and loss of control. In more elaborately specified models, therefore, we need to take additional individual-level variables, such as perceived control and Internet efficacy into account. Secondly, as illustrated by Hiltz and Johnson (1989), future work on technology-based applications should not assume that subjective satisfaction alone suffices as an indication of successful system implementation. Actual usage levels of a service or its benefits, such as the impact on customer productivity, could be included in future research on the effectiveness of innovative service delivery modes. Thirdly, in order to achieve further improvement of model specification, additional aggregate or country-level variables should be included in models. These include level of economic development (Steenkamp et al., 1999) and degree of Internet penetration and acceptance. Additional research should focus on the role of these predictor variables on the relationship between service quality and satisfaction. Finally, research attention should be devoted to the operationalization of cultural characteristics. As already mentioned, the prevalent Hofstede scores represent work-related values, which may not entirely suitable for consumption-based values. Therefore, additional conceptualizations of national culture should be explored, such as Schwartz's value scheme (Smith & Schwartz, 1997).

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