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High Tech and High Touch: A Framework for Understanding User Attitudes and Behaviors Related to Smart Interactive Services

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Abstract

Smart interactive services, in contrast with other technology-based services, require significant human-to-human interaction and collaboration in addition to the service provided by the embedded technology itself. The authors' foundational Delphi study confirms smart interactive services (e.g., remote diagnosis, remote repair of equipment, and telemedicine) are a rapidly growing innovation category across industries. Yet, gaining user acceptance of these types of services presents a significant challenge for managers. To address this challenge, the authors employ a grounded theory approach, drawing on depth interviews, to develop a framework of barriers and facilitators to users' attitudinal and behavioral responses to smart interactive services. The findings reveal a new set of beliefs that are critical in this context. These beliefs are tied to the human element and specifically pertain to beliefs about the "service counterpart (SC)," who is the provider's employee controlling the technology. Control, trustworthiness, and collaboration beliefs emerge jointly as important and interrelated influencers tied to the SC. Contrary to conventional wisdom that focuses on features of the technology itself to gain user acceptance, this research encourages providers to emphasize the interpersonal elements of the service by providing control cues, raising social presence, and enhancing human trust mechanisms.

Keywords

service technology, technology-mediated service, service counterpart, smart service, remote service, technology adoption

Intelligent products that contain information technology (IT) in the form of microchips, software, and sensors provide companies with the means to collect, process, and produce information to serve customers and provide solutions in many domains (Rijsdijk, Hultink, and Diamontopoulos 2007). Ultimately, this development enables firms to provide services anytime, anywhere, and transparently to users through devices embedded in the physical environment (Lyytinen and Yoo 2002). Services delivered to or through intelligent products that feature awareness and connectivity are called "smart services" (Allmendinger and Lombreglia 2005) and include preemptive services, such as remote monitoring of intelligent machines (Biehl, Prater, and McIntyre 2004), self-services, such as information services made available for the customer through Internet access via car electronics (Lenfle and Midler 2009), or highly interactive services, such as collaborative remote repair of machines or remote surgeries with collaborating physicians at distant locations (Sila 2001).

Smart services are not a fad or an anomaly; instead, they represent a fast-growing category of service that extends to many business-to-business (B2B) and business-to-consumer (B2C) settings, such as mechanical engineering, health care, information and communication technology (ICT), automotive, and household appliances (Fano and Gershman 2002). The rapid development of smart services has been pushed by the escalating dispersion of ICTs worldwide, with investments into smart objects and service equipment of more than US$120 billion in 2009 and projected to increase to US$350 billion in 2014 (Harbor Research 2010). In industries that increasingly rely on advanced ICTs, such as manufacturing, medical devices, utilities, mining, and oil and gas, the percentage of smart service–enabled objects among companies' serviceable assets has increased from 11.7% in 2007 to 27.9% in 2009 (Dutta 2009).

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The implementation of smart services is expected to result in substantial efficiency gains on both the provider's and the user's side from benefits such as cost reductions, increased flexibility, increased access, and time savings (Allmendinger and Lombreglia 2005). Yet, despite the rapid growth and potential for smart services from a technology and productivity perspective, the greatest challenges managers often face are gaining customer acceptance and increasing usage of these new innovative services (Biehl, Prater, and McIntyre 2004). Keh and Pang (2010) recently showed that customers perceive technology-mediated services as risky. As these perceptions influence customers' buying decisions, smart service providers need to overcome these obstacles to raise user acceptance of smart service innovations.

Whereas some smart services are delivered object-to-object with no human contribution whatsoever, others involve customers and employees as integral participants. In our studies, we focus on the latter type—labeled smart interactive services—which comprises not only an embedded technology within the product that communicates object-to-object but also personal interactions between the user and the service provider employee as part of the smart service delivery process. An illustrative example is the remote repair of high-volume printing equipment (the focus of our study), in which a service provider's employee remotely accesses a printing machine to diagnose and solve a complex machine failure. The employee then interacts with the user located at the machine's console to repair it remotely, jointly, and interactively.

Systematic research on users' attitudes toward and use of this emerging and rapidly growing category of service innovations is lacking. Studies on related technology-intensive services capture only a fraction of relevant factors for understanding customer attitudes, adoption, and usage when moving from face to face to smart interactive services. Thus, this work is conceptual in nature (MacInnis 2011) and aims to explore attitudes toward and use of smart interactive services while identifying a more complete set of acceptance and usage barriers and drivers. We contribute to the literature by (1) identifying and establishing the status quo and future trends of smart interactive services in mechanical engineering, health care, ICT, automotive, and household appliances; (2) delineating smart interactive services along the dimensions of user and provider activity from other types of services, such as self-services, machine-to-machine services, and provider active services; (3) developing a foundational framework comprising a unique set of beliefs as drivers of users' attitudinal and behavioral responses to smart interactive services; and (4) suggesting important implications for further research and for managers. In particular, we integrate previously unrelated service research streams, such as remote services in mechanical engineering, telemedicine, telematics, and interactive IT services under the smart services paradigm.

With our research, we discover that customers' attitudes and usage intentions toward interactive smart service are formed by complex belief structures. We identify beliefs that are driven by the technology-mediated collaboration between the customer and the service employee. In this context, we refer to the service employee as the "service counterpart" (SC). Beliefs about the control over, the trustworthiness of, and the collaboration with an SC, the interrelationship between control and trustworthiness beliefs, and the effects of social presence beliefs all emerge as important influencers of attitudes and usage behavior above and beyond technology features alone.[1]

The structure of this article is as follows: First, we frame the research by delineating the smart service context and highlighting relevant research streams in information systems and marketing as theoretical foundations for our research. Second, we establish the status quo and future trends in smart interactive service usage, employing a cross-industry Delphi study. The Delphi study yielded first insights into customer perceptions and potential acceptance barriers. This is the starting point for our exploratory interview study in a B2B context, in which we derive a comprehensive framework for understanding users' attitudinal and behavioral responses (hereinafter, we refer to them as user responses) to smart interactive services, including attitudes, usage of these services, and usage intentions. We employ a grounded theory approach that draws on interviews in the United States, Germany, and China. We conclude with potential avenues for further research and managerial implications for smart service providers.

Smart Interactive Services

In this article, we focus on the type of smart interactive services that features a high level of interaction between customer and provider during the service delivery. Smart interactive services are present in many industries and business scenarios covering both consumer and business markets. Before we discuss this service type in detail, it is useful to put it into the context of the more broadly defined smart services. The defining characteristic of smart services is the delivery to or through intelligent products or connected objects (Allmendinger and Lombreglia 2005). They form a heterogeneous group of services that exhibit different levels of customer interactivity involved in the service delivery.

Categorizations on customer–provider interactions within services are scarce. Bolton and Saxena-Iyer (2009) develop a classification of services based on the interactivity within services and the technology level necessary to enable the service. They distinguish two types of technology-enabled services by the degree of customer participation such, as "highly interactive services" and "continuously provided services." However, both the degree *and* the type of interaction are appropriate dimensions for differentiating smart services. Corsten (1991) develops an activity portfolio of service actions to delimit different types of customer participation based on the activity level of the human SCs, on both the customer and the provider side. We adapted Corsten's activity portfolio to the technology-mediated context of smart service to develop the smart service interactivity matrix as shown in Figure 1.

The horizontal axis of the smart service interactivity matrix in Figure 1 describes the intensity of human provider activity

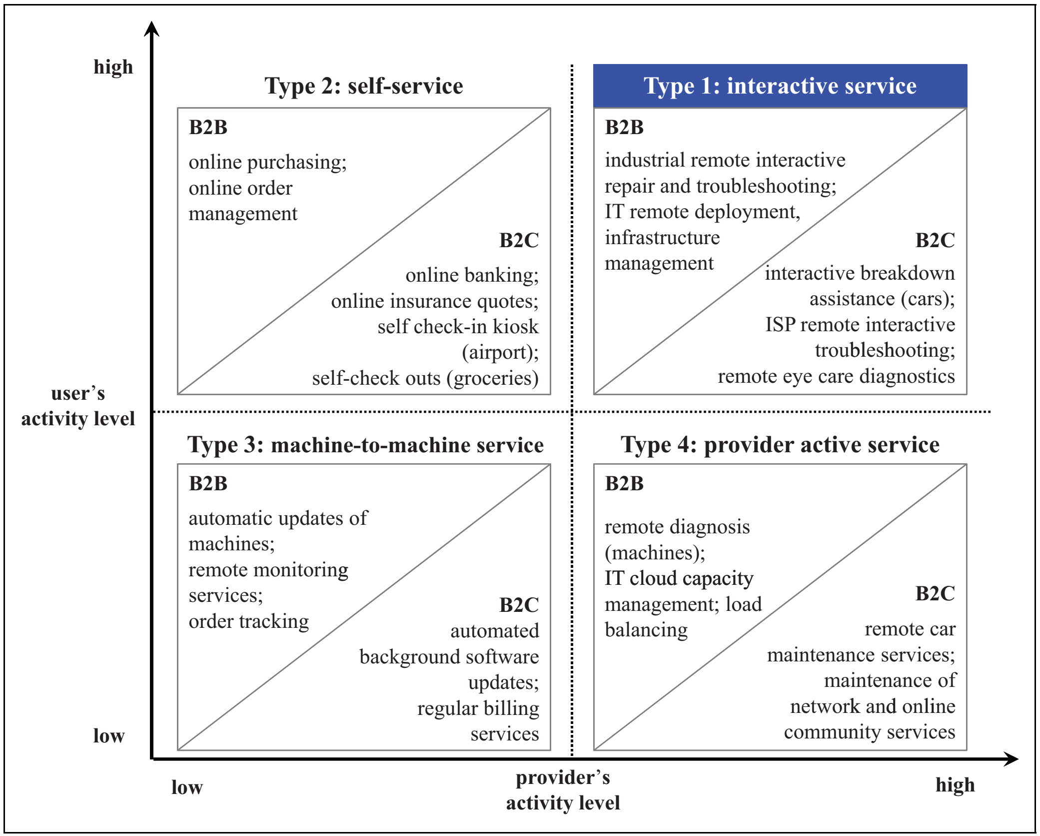

Figure 1. Smart service interactivity matrix.

during the smart service delivery; the vertical axis describes the intensity of human customer or user activity during the smart service delivery. In all cases represented by this matrix, there is a technology-based service in the form of a connected object at the core. Activity levels of users and providers range from low to high. No or low *user* activity may include actions such as the mere deployment of smart objects, whereas high user activity involves several conscious actions in sequence (e.g., at a self-check-in kiosk at an airport). No or low *provider* activity may include only the provision of the connectivity itself or the provider's personal activation of some procedures the user can then run on his or her own, whereas high provider activity involves more actions and intensity, such as in remote surgery.

We distinguish smart interactive services (Type 1 in the matrix)—the focal service type—from three other types of smart services: self-service (Type 2), machine-to-machine service (Type 3), and provider active service (Type 4). Examples of each type in B2B and B2C contexts appear in the smart service interactivity matrix. Whereas the delivery of machine-to-machine services requires hardly any human presence or activity during service delivery (Conti 2007), the production of self-services requires mainly single-sided actions by the user with the technology (Dabholkar 1996). In parallel, provider active smart services require mainly one-sided actions by the service provider.

In contrast with these service types, the production of smart interactive services requires significant interaction and collaboration between user and provider. For example, while troubleshooting Internet connection problems, an Internet service provider employee logs in to a consumer's household digital subscriber line (DSL) modem to diagnose and repair the connection problems. During this process, he instructs and collaborates with the customer to try different network setups and router configurations, while monitoring and configuring the connected objects (e.g., network router, DSL modems, and external switches). The user is highly involved because he must physically change connections and configure the devices that cannot be accessed remotely by the service provider. In interactive services, in which technology is a mediator between user and provider and the human SCs interact in real time, both components—the perception of the technology and the interaction with the smart interactive service provider—play substantial roles in the user's service experience. Furthermore, a smart interactive service requires user collaboration with the provider, resulting in potentially high levels of service coproduction.

Many examples exist in both the B2B and the B2C sector for smart interactive services in a variety of industries. In mechanical engineering, these services are often provided under the term remote services, such as remote repair, remote diagnosis, and remote maintenance. Communication devices for regular remote maintenances or remote repairs, in case of failure, are already incorporated in the conceptual design phase of machines. Interactive smart services in health care are often summarized under the term telemedicine and are used in prevention, diagnosis, therapy, rehab, and care, in forms such as remote diagnosis or even remote surgery (Sila 2001). In the ICT sector, smart interactive services comprise system administration, software deployment, error analysis, and troubleshooting of systems.

Theoretical Foundations

Technology Acceptance and Technology-Intensive Service Adoption

The technology acceptance model that Davis (1989) originally formulated within the information systems literature is one of the most widely tested models specifically geared toward technology acceptance. It is grounded in behavioral models, such as the theory of reasoned action (Fishbein and Ajzen 1975), and focuses mainly on perceived usefulness and ease of use as central drivers of technology usage. Recently, adoption drivers have been identified that go beyond these utilitarian benefits that users accrue from their interactions with technology itself, extending these to factors surrounding the use of IT to explain artifact adoption (Al-Natour and Benbasat 2009). Most noteworthy, studies on technology acceptance are mostly embedded within organizational settings, such as the introduction of a new information software system (Malhotra and Galletta 2008) or sales force automation systems (Speier and Venkatesh 2002).

Little research is available within information systems that explicitly addresses technology acceptance embedded in customer–provider service relationships (e.g., Featherman and Pavlou 2003). The limited research that does exist focuses predominantly on self-services and e-services and not on the service relationship at the human-to-human level between the service user and the SC. As a result, these studies have mainly identified factors such as technology features or individual users' attitudes toward the technology as antecedents of service acceptance and service satisfaction (Featherman and Pavlou 2003). Individual personality traits, such as self-efficacy beliefs (Hwang and Yi 2002) and desire for personal contact (Walker and Johnson 2006), and core technology features, such as compatibility and usability (Venkatesh 2000), are important aspects of technology-intensive service acceptance.

Similar to the self-service research in the information systems field, empirical models in marketing that explain technology-intensive service usage focus primarily on self-service technology (e.g., Collier and Sherrell 2010; Meuter et al. 2005). In this context, the user's personal characteristics, such as technological readiness, motivation, ability, role clarity, inherent novelty seeking, need for interaction, trust in technology, and self-consciousness, along with characteristics of the technology itself, have been demonstrated to influence adoption behavior (e.g., Dabholkar and Bagozzi 2002; Parasuraman 2000; Zhu et al. 2007).

Customers and Employees as Collaborators

Research in marketing argues that the service encounter may be the most important antecedent in customers' evaluations of service performance (Brown and Swartz 1989). Research demonstrates that employee behavior characteristics, including attentiveness and courteous behavior (Gremler and Gwinner 2008); effort (Mohr and Bitner 1995); reliability and responsiveness (Parasuraman, Zeithaml, and Berry 1985); competence, helpfulness, and sociability (Surprenant and Solomon 1987); and intimacy and humanity (Kellogg and Chase 1995), are relevant to the customer's perception in a service encounter. For the most part, research on service encounters and the impact of contact employees focuses on interpersonal, nontechnology service encounters. Recently, however, a few studies in the service operations literature have addressed the customer's perception of the SC in technology-mediated service encounters (Froehle and Roth 2004). Here, the effect of the SC's knowledge, preparedness, and thoroughness on customer satisfaction has been supported (Froehle 2006), but the customer's concurrent perception of the technology and collaborative aspects, which is especially relevant to the technology-mediated service context, has not explicitly been explored in these studies.

Smart interactive services constitute an interpersonal collaboration between provider and customer, which can be considered an intensive form of customer participation or coproduction. The concept of customer participation[2] has become a major topic of discussion in services marketing thought and practice worldwide (e.g., Bendapudi and Leone 2003; Etgar 2008; van Doorn et al. 2010; Vargo and Lusch 2008). Dabholkar (1990, p. 484) provides a succinct definition of customer participation as "the degree to which the customer is involved in producing and delivering the service." Customers' participative behavior in services is one of the main drivers of service usage, service effectiveness, customer satisfaction, value perception, quality, and recovery (e.g., Auh et al. 2007; Chan, Yim, and Lam 2010).

One prominent approach to explaining customer participation behavior in service marketing literature is based on Vroom's (1964) model of determinants of employee behavior. This theory is rooted in human resources research and industrial psychology and identifies a set of determinants comprising role clarity, ability, and motivation as drivers of behavior. Role clarity reflects the customer's knowledge and understanding of what type of participation needs to take place. The rationale is that if customers know what to do and how they are expected to perform, they are more likely to do what is needed (Mills, Chase, and Marguiles 1983). Indirectly, this expresses a need to inform customers about the activities and behaviors needed for an effective service encounter (Kelley, Donnelly, and Skinner 1990). Role ability means possessing the required skills and confidence to complete the tasks necessary during the participation (Meuter et al. 2005). In this context, motivation refers to the desire to receive the rewards associated with participation. It is closely tied to the concept of value the customers experience in participation. This set of drivers for coproduction in services has been explored in both nontechnology service settings (Dellande, Gilly, and Graham 2004) and technology-enabled services, such as self-services (Meuter et al. 2005).

Table 1. Theses of the Delphi Study and Expert Opinion After the Second Round[a].

Thesis #	Thesis	Expert Opinion
1	10% of all services that need interactivity will be delivered remotely	31% of all experts agree or strongly agree with this thesis. Most experts foresee this will happen by the year 2020
2	80% of all maintenance and monitoring services for machines and mechanical plants will be delivered remotely	71% of all experts strongly agreed with this thesis. Most experts foresee this will happen by the year 2015
3	80% of all diagnosis and monitoring services in health care will be provided remotely	76% of all experts agree or strongly agree with this thesis. Most experts foresee this will happen by the year 2015
4	80% of all implementation, administration, maintenance, and repair services of information technology (IT)-systems will be done remotely	79% of all experts agree or strongly agree with this thesis. Most experts foresee this will happen by the year 2015
5	80% of all metering services of household appliances, such as heating devices and water supply systems, will be provided remotely	20% of all experts agree or strongly agree with this thesis. Most experts foresee this will happen by the year 2025
6	80% of interactive diagnostic and repair services for cars will be provided remotely	31% of all experts agree or strongly agree with this thesis. Most experts foresee this will happen by the year 2015

Note. [a]In the Delphi study, the theses were stated in relative extreme terms to get the experts to react.

The current research aims to address gaps in both the information systems and the marketing literature. It does so by identifying usage patterns across different industries and developing a framework that accounts for both technology-based and human interaction–based determinants of user attitudes toward smart interactive services.

Study 1: Delphi Study

The aim of our first study is to explore whether smart interactive services are an anomaly or whether they are indeed a new and growing phenomenon. We strive to determine how smart interactive services are applied in multiple industries, how likely these services are to be adopted in the future, and what general barriers and drivers to usage can be expected. This serves as a foundation for the in-depth interview study, which aims to provide a detailed understanding of the factors that influence user responses to smart interactive services. We conducted a Delphi study (Brüggen and Willems 2009; Rowe and Wright 2001) to gain insights into the future usage of smart interactive services and their adoption rates in five different industries with a high economic impact: (1) mechanical engineering, (2) health care, (3) ICT, (4) automotive, and (5) household appliances.

Study Context and Methodology

A Delphi study is an interactive forecasting method that enables experts to discuss a complex problem through a structured iterative communication process (Linstone and Turoff 1975). In this process, individual experts answer questionnaires in two or more rounds. After each round, the researcher provides an anonymous summary of all the experts' answers as well as the reasons they gave for their judgment. In the following rounds, the experts can revise their judgments/ideas in line with the opinions of the other experts stemming from the previous rounds. In the end, this process should produce the collective thought of the group (Rowe and Wright 2001). We conducted our Delphi study using a two-round design with experts from Germany, Austria, and Switzerland. For the expert panel, we selected participants on the basis of their knowledge of services and technologies used in at least one of the following fields: IT, mechanical engineering, health care, automotive, or household appliances. We identified the experts by research and pyramiding, in which experts were asked to recommend other potential panelists. We cross-referenced the identified potential panelists and selected those who were perceived as experts in their respective fields by at least three other experts.

We proposed six major theses to the experts about the future trends in smart service usage in four different industries (for the six theses and related expert opinions, see Table 1). In the course of the Delphi study, each thesis was evaluated by experts. They were specifically asked to assess the likelihood of occurrence, a probable time horizon, and customer acceptance. In addition, the experts were asked through open-ended questions to communicate their own ideas, suggestions, and elaborations on smart interactive service applications, potential adoption barriers, and drivers.

In total, 126 experts participated in the first round of the Delphi study, which started on June 12 and ended on June 30, 2006. The experts mainly came from diverse backgrounds, including IT (28%), health care (18%), mechanical engineering (17%), and automotive and household appliances (8%), as well as from academia, research institutes, and the public sector (14%). The panel also included well-known economists, futurologists, technology sociologists, and political experts. Starting on July 3, 2006, we sent the second survey with the same questionnaire to the same experts who participated in the first round. In addition, we provided the mean of the experts' ratings on the rating scales and a compilation of the expert opinions from the open text fields. In total, 64 experts participated in the second round of the Delphi study.

Results

Overall, the experts gave valuable insights into the application scenarios of smart interactive services across industries. They evaluated smart interactive services as a new service type that has recently been introduced in both consumer and business markets, albeit at different adoption stages. The experts forecast an increasing diffusion and usage rate of smart interactive services across all fields (see Table 1). Despite the forecasted growth of smart interactive services, the experts also voiced industry-specific concerns about the adoption of this service type.

In mechanical engineering, the experts acknowledged that possible application areas for smart interactive services were mainly in remote maintenance and repair of critical production parts. They predicted a high acceptance rate after initial acceptance problems were solved. The experts' statements suggested that the main barriers to acceptance were customers' security concerns and the desire for personal contact. In health care, the experts indicated a high acceptance rate of remote monitoring and diagnostic services but a low acceptance rate for contact-intensive services, such as initial consultations or surgeries, because of physicians' and patients' desires for personal contact. In contrast, the Delphi experts foresaw comparatively fewer barriers in the ICT sector. Again, the main obstacles were identified as customers' security concerns and the desire for personal contact in critical situations in which equipment failure could lead to substantial loss of revenue. The experts suggested that in scenarios in which provider and customer were located in different countries, overcoming language barriers and cultural differences in collaborating practices would be important. Moreover, the experts foresaw an increasing, long lasting trend in the provision of smart interactive service in the realm of consumer electronics and household appliances, though it was connected with specific acceptance barriers. Experts forecast that end consumers might consider household services an intrusion into their privacy and worry that remote access enables "cheating" by the provider. Some experts believed that the end consumers' concerns and trust issues were tied to an unclear understanding of who has control over their devices and how the consumer is supposed to act in a smart service situation.

Study 2: Interview Study

The results of the Delphi study predicted usage patterns based on expert opinions and underscored the recent and future importance of this service type across different industries for both B2B and B2C markets. However, the experts also emphasized major acceptance barriers such as security concerns, need for personal contact, trust issues, and control. Our second study aims to explore these barriers and investigate acceptance drivers systematically and in-depth with the goal to derive a conceptual framework for understanding the factors that influence user responses to smart interactive services.

Study Context and Methodology

We chose mechanical engineering in the printing industry as the study context for developing our theoretical and conceptual model because of the current availability of smart interactive services and the Delphi study experts' forecast of the substantial growth in this sector. Smart services in the printing industry are provided by press manufacturers through smart printing machines to their clients, which are usually printing companies. In the printing industry, smart services are offered as remote maintenance, remote repair, and remote diagnosis services. An illustrative example of a smart interactive service is the remote repair of a high-volume printing machine. A service provider engineer located in the United States remotely accesses a printing machine in China to diagnose and solve a complex machine failure. During the process, the SC (the provider in the United States) and the user (in China) interact and collaborate in a completely technology-mediated contact situation; verbal communication is established with a telephone call or a chat option at the machine console. The interaction is mediated through network technology that enables the provider's employee not only to converse and give instructions to the customer but also to directly perform a reconfiguration of the machine.

We employed face-to-face depth interviews as a method to capture the underlying dimensions of how users perceive and interpret the smart interactive service situation. To achieve a holistic view of users' attitudes, we interviewed employees of smart service customer companies (user interviews). These customer companies use services provided by different service providers and, in some cases, even use the services of more than one provider. In addition, we interviewed employees in different national branches of a global service provider company (provider interviews). We conducted the study from August 2006 to January 2008 with participants from Germany, the United States, and China. Following grounded theory methodology (Glaser and Strauss 1967), we used a theoretical sampling procedure (e.g., Tuli, Kohli, and Bharadwaj 2007), in which decisions about what data should be collected next are determined by the theory being constructed. The smart service customer companies were recruited mainly through contacts with independent local associations of printing companies in the three different countries.

During the study, we continuously recruited interviewees who were knowledgeable and could add to the information we obtained in the previous interviews. Therefore, the goal of the sample selection was to develop maximal diversity of knowledge and experience, such as participants (1) from different countries (Germany, the United States, China), (2) from different standpoints on smart services (service providers and users), (3) with different experience levels in smart service usage (frequent experience, little experience, or no experience), and (4) with experience with different types of smart services (e.g., remote monitoring services, remote diagnosis, and remote repair). We sought viewpoints from people at all managerial levels. Participants represented distinct organizational levels (e.g., machine operator, foreman, production manager, general manager, owner, service manager, sales manager, and remote service technician).

In total, we interviewed 30 people at their respective places of business. All interviews lasted between 60 and 90 min. Of

Table 2. List of Participants of the Interview Study.

No. of Respondent	Interviewee's Characteristics					Interview Location
	Role	Function	Gender	Business Field	Experience Level[a]	
1	User	Owner	Male	Printing Company and Book Bindery	Intermediate	Germany
2	User	Production manager	Male	Printing Company and Book Bindery	Low[b]	Germany
3	User	Machine operator	Male	Printing Company	High	Germany
4	User	General manager	Male	Printing Company	Low	Germany
5	User	Owner	Male	Book Bindery	Intermediate	Germany
6	User	Production manager	Male	Printing Company	High	Germany
7	User	Foreman	Male	Printing Company	High	Germany
8	Provider	Sales manager	Male	Press Manufacturer and Service Provider	—	Germany
9	User	Production manager	Male	Printing Company	High	USA
10	Provider	Sales manager	Male	Press Manufacturer and Service Provider	—	USA
11	Provider	Director BD	Male	Press Manufacturer and Service Provider	—	USA
12	Provider	Manager technical support	Male	Press Manufacturer and Service Provider	—	USA
13	Provider	Manager technical support	Male	Press Manufacturer and Service Provider	—	USA
14	Provider	BD specialist	Female	Press Manufacturer and Service Provider	—	USA
15	Provider	Remote service technician	Male	Press Manufacturer and Service Provider	—	China
16	Provider	Branch manager	Male	Press Manufacturer and Service Provider	—	China
17	Provider	Remote service technician	Male	Press Manufacturer and Service Provider	—	China
18	Provider	Sales manager	Male	Press Manufacturer and Service Provider	—	China
19	Provider	Branch manager	Male	Press Manufacturer and Service Provider	—	China
20	Provider	Remote service technician	Male	Press Manufacturer and Service Provider	—	China
21	Provider	Remote service technician	Male	Press Manufacturer and Service Provider	—	China
22	User	Production manager	Male	Printing Company	Low	China
23	User	Machine operator	Male	Printing Company	High	China
24	User	Foreman	Male	Printing Company	High	China
25	User	General manager	Male	Printing Company	Low	China
26	User	Machine operator	Male	Printing Company	High	China
27	User	Production manager	Male	Printing Company	Low	China
28	User	Production manager	Male	Printing Company	Low	China
29	User	IT manager	Male	Printing Company	Intermediate	China
30	User	Production manager	Male	Printing Company	Intermediate	China

Note. [a]Customers' experience level with smart interactive services.
[b]Some interviewees have not had direct exposure to smart interactive services. However, they have heard about smart interactive services, and different providers in the industries have demonstrated versions of the service. Therefore, we labeled their experience level as "low."

the interviewees, 17 worked for 13 different companies that purchase and use smart interactive services, and 13 interviewees represented 3 different companies that provide and sell smart services. Geographically, 8 participants were from Germany, 6 were from the United States, and 16 were from China. Table 2 shows the descriptive characteristics of all participants. The need for further interviews ceased after the 30th participant because it was apparent that we had reached a point of information saturation, and we no longer expected to obtain unique findings under the current interviewing procedure (Strauss and Corbin 1990).

The specific purpose of the interviews was to learn as much as possible about the participants' concerns, perceptions, reactions, and thoughts in connection with smart interactive services. We asked each participant open questions pertaining to his or her service experience and attitude toward smart interactive services or comparable services, such as "What kind of experiences did you have with this type of service?" "Can you describe how you experience the delivery of smart interactive services?" "How do you feel during the service?" "How may your counterpart (customer/provider) feel during the service?" and "How does your experience with this service type differ from your experience with face-to-face services or self-services?"

Analysis

The analysis procedure followed the grounded theory approach formulated by Glaser and Strauss (1967) and more recently employed in organizational management and marketing

Table 3. Coding Categories.

	Metacategory	Belief Category	Sources	Quotations
SC beliefs	Control		***19***	***49***
		Control over SC	13	22
		Transparency	7	15
		Control mechanisms	6	12
	Collaboration		***15***	***54***
		Role clarity	10	15
		Guidance from SC	5	9
		Self-efficacy	9	13
		Willingness	10	17
	Trustworthiness		***13***	***38***
		SC reliability	7	13
		SC goodwill	5	10
		SC expertise	8	15
	Social presence		***11***	***36***
		Social contact	11	21
		Personal communication	9	15
Other beliefs	Economic benefits		17	61
	Technology features		10	44
	Organizational benefits		10	34
	Brand image and reputation		8	15
	Contextual beliefs		6	26

Note. SC = service counterpart.

literature (Isabella 1990; Ringberg, Oderken-Schröder, and Christensen 2007). This approach requires that data are collected and analyzed simultaneously. Data and theory are constantly compared and contrasted throughout the data collection and analysis process. The transcribed versions of the interviews, notes, and tapes, including both the original language audio and the statements by the on-site translators, constitute the material for the subsequent interpretation of meaning through qualitative content analysis (Mayring 2000; Neuendorf 2002).

During the data collection and analysis phase, specific details and thoughts were repeated by several participants and augmented the evolving theory. Therefore, we formed preliminary categories of statements that address important beliefs to organize the data. Throughout the process, we coded the source material using an inductive approach for category development (Strauss and Corbin 1990) with the purpose of classifying the thoughts and details of the interviews into an efficient number of categories representing similar meanings (Weber 1990). In total, 357 quotations contained in 114 single-spaced pages of text from the interview transcripts were related to the categories. Following an iterative process, we combined related belief categories into metacategories. For example, we subsume "transparency" (15 quotations) and "control mechanisms" (12 quotations) together with "control over SC" (22 quotations) under the "control beliefs" metacategory (49 quotations total, mentioned by 19 interviewees). The final coding scheme consists of nine metacategories excluding the outcome category. We used the qualitative data analysis software package NVivo7 to support the text interpretation. Table 3 shows the number of quotations and sources for each category.

To ensure validity and reliability, we employed best practices in the qualitative study design recommended in the literature (e.g., de Ruyter and Scholl 1998). For example, we conducted face-to-face-interviews in the respondent's own environment to ensure meaningful, consistent perceptions tied to real-life contexts. Two judges with expertise in smart services verified the iterative process of category building and the independent coding. They reproduced the category-building process with similar outcomes and confirmed the intercoder reliability of the content analysis. The judges independently assigned the 357 statements to the nine metacategories. Three intercoder reliability measures were derived: proportional agreement, Perreault and Leigh's (1989) measure (PL), and the proportional reduction in loss (PRL; Rust and Cooil 1994). The resulting proportional agreement of .868 is well beyond the recommended cutoff point of 80% that Neuendorf (2002) proposes. The most accurate measures from a theoretical perspective are PL and PRL. In a two-judge case, PL and PRL are equivalent; their value in this study is .923. In line with Rust and Cooil (1994), this value can be considered good because it is higher than the suggested minimum of .8. Therefore, we can assume good intercoder reliability.

Smart Interactive Service Framework

The major themes that emerged from the interviews with users and providers form the foundation of a conceptual framework for understanding the factors that influence user responses to smart interactive services. In Figure 2, we present the conceptual framework that proposes 9 metacategories and 12 belief

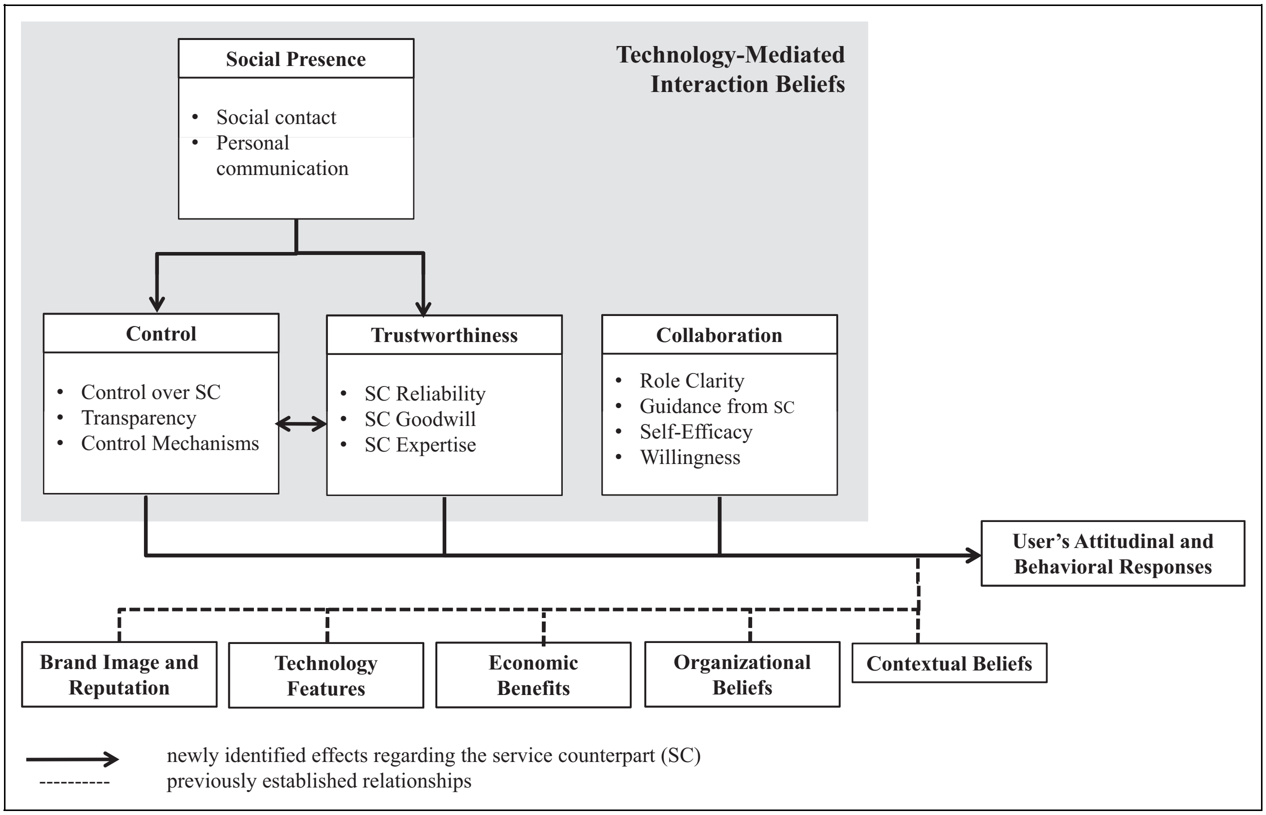

Figure 2. Smart interactive service framework.

categories as influence factors on users' responses to smart interactive services that comprise attitudes toward smart interactive services, usage of these services, and usage intentions. The belief categories are nested in four metacategories related to the technology-mediated interaction with the SC: (1) control beliefs, (2) trustworthiness beliefs, (3) collaboration beliefs, and (4) social presence beliefs. The remaining five metacategories are reflective of previous literature on technology usage and include (5) brand image and reputation, (6) technology features, (7) economic benefits, (8) organizational beliefs, and (9) contextual beliefs. The dotted lines in Figure 2 capture relationships that research on technology-based product/service usage has previously established (e.g., Davis 1989; Kim and Malhotra 2005; Komiak and Benbasat 2006; Teo, Lin, and Lai 2008).

In the sections that follow, we focus on the *new* effects (solid lines in Figure 2) uncovered by our research, all of which center on beliefs associated with the SC as opposed to beliefs about the brand, price, or technology features. Specifically, we focus on the effects of control over the SC, the trustworthiness of the SC, and the collaboration with the SC on user responses; the interrelationship between control and trustworthiness beliefs; and the effects of social presence beliefs on control and trustworthiness perceptions. We provide propositions for the effects and interrelationships of human interaction beliefs in a technology-mediated service setting, adding new constructs and deeper explanations to existing literature.

Perceiving Control Through Technology-Mediated Interaction

From the interviews, we obtained substantial evidence for the importance of control factors and their influence on user responses to smart interactive services. The users mentioned the importance of control over the service process itself and also with regard to the SC's actions. The importance of control beliefs also became clear in their use and need for control mechanisms to stop, abort, change, or direct the SC's actions. For example, as one user (R.4[3]) stated:

> Control plays a very important role. I want to decide what exactly is done with my machine.

In contrast with face-to-face encounters, in which customers can usually directly monitor and take corrective actions, smart interactive service situations substantially limit these possibilities. Most users view smart services as risky and search for tangible clues about the interactive collaboration process with the service provider (e.g., observable log-in protocols, real-time representation of the SC's actions). Regarding the high-risk perceptions of some users, it is understandable that they want to monitor the actions of the SC to prevent him or her from making mistakes and damaging the machine. According to the users' statements, a high level of transparency and the availability of control mechanisms are desirable during the complete service process. As a user (R.9) indicated:

> I have complete control. If they're doing something and I think that I don't want them to do that, I can disconnect the service and they lose control over the machine.

In the interviews, a need for process transparency became apparent. Transparency can be established through communication regarding the process or log-in mechanisms and protocols. For example, as one user (R.27) noted:

> I wish the service had a documentation function. That means, it can record detailed information of each time, for example, when, where, which machine, the reason, how to fix, and so on. We record the information by ourselves, too. The function is just like case history of a patient. It is very important.

Control over a human interaction partner has been ignored in services marketing and in studies on technology adoption. However, controllability has been studied in other contexts, such as control over one's own behavior (Ajzen 1985), control over service processes (Collier and Sherrell 2010), and control over another organization in strategic alliances (Das and Teng 2001). We explore control beliefs that exist in a technology-mediated environment and go beyond process control perceptions by focusing instead on a human counterpart. On the basis of our findings, we derive the following:

Proposition 1: The perception of control (as reflected in control over the SC, the transparency of the SC's actions during smart service interactions, and the existence of control mechanisms) positively influences the user's attitudinal and behavioral responses to these services.

Perceiving Trustworthiness Through Technology-Mediated Interaction

The exploratory interviews highlight the importance of trust beliefs and their impact on smart interactive service attitudes. The SC's trustworthiness is important, especially if users are evaluating a smart interactive service with an active SC accessing their machines. In contrast with a self-service system in which the system response is rather predictable and a worst-case scenario is the service simply being unavailable or not functioning, in a smart service encounter the SC could actually damage the service object, resulting in substantial downtime and costs, or access private and confidential information. Moreover, unlike in a face-to-face encounter, the SC's actions are not visible to the customer. The interviews indicate many aspects of trustworthiness, comprising several slightly different accentuated beliefs, such as goodwill, reliability, and expertise of the SC. Because of the high-risk perception of smart services, the users' perceptions that the SC adhered to a set of agreed-on principles were important. The following statement from a user (R.9) highlights the belief in the reliability of the SC:

> This is my experience with [company name], how they have well-trained, very well-mannered technicians, and if I ask them not to do something I'm sure that they will stick to it.

In general, the SCs were credited with high skills and competencies. Some users noted that the skills of a remote service technician are greater than the skills of on-site technicians because smart services enable them to more easily contact experts than locally available on-site technicians. The expertise of the SCs was considered one of the major and essential reasons for a successful service outcome. As a user (R.1) indicated:

> [The] guy who remotely logs into our machine is most likely the absolute specialist for this model. Not like a typical mechanic, who has to do 20 different machine models and just happens to be the guy located in the branch nearby.

In only a few cases was the general trustworthiness of an SC viewed negatively. One user in Germany, who was dissatisfied in general with the smart interactive service, attributed his feeling of disappointment to a lack of goodwill of the SC. This underscores the importance of benevolent, trust-assuring behavior of the SC that goes beyond task-related behavior. Customers seem to appreciate if the SC shows goodwill by having the customer's needs and situation in mind, by showing sensitivity to the needs of the other party, and by not taking economic advantage of the other party. An interactive smart service user (R.5) stated his opinion of technicians, as follows:

> Sometimes I get the impression that they [the technicians] don't have a clue what to do. They do not really help me. At least they don't do everything in their power to help me and they do not think proactively and foresighted.

Other customers experienced goodwill shown by an SC. This benevolent behavior increased the trustworthiness of the SC from the customers' perspective and positively influenced their attitudes toward interactive smart services, as a foreman (R. 7) stated:

> Once the technician really helped us a lot, he did not only repair the machine but also helped us in configuring our print job, it was not his official task but he did it anyway . . .. He is a good guy, we trust him.

Trustworthiness of a service interaction partner has frequently been studied in marketing as a driver of interpersonal relationship building (Crosby, Evans, and Cowles 1990; Jones, Taylor, and Bansal 2008) and risk taking (Mayer, Davis, and Schoorman 1995). However, the influence of interpersonal trust on technology-mediated service usage intention has not been studied other than in contexts in which the object of trust is a company or brand, not a human SC (see Gefen, Karahanna, and Straub 2003; Pavlou 2003). On the basis of the findings of our interview study, we therefore propose the following:

Proposition 2: The perception of the SC's trustworthiness through smart service interactions (as reflected in goodwill, reliability, or expertise) positively influences the user's attitudinal and behavioral responses to these services.

Although the objects of trust beliefs include both the SC as the social interaction partner during a smart service and the service provider company on a brand trust level, the trust in the human interaction partner was more essential. The statements show that personal factors related to the SC have strong positive effects on the user responses to smart interactive services. In addition, the majority of users seemed to build a relationship with the company through individual relationships with the SCs. The following statement by a user (R.9) underscores the importance of trust in the individual SC:

> My trust towards [company name] is based on the relationships I have with the people, the technicians.

Most users weigh the trust in the human interaction partner higher than the trust based on brand image and reputation of the company itself, as one user (R.7) stated:

> We trust the technicians more than [company name] in general.

Prior work shows mixed findings about the relationship between interpersonal and organizational trust. Trust in the store brand has been shown to be a stronger antecedent of buying intentions than trust in a salesperson (Guenzi, Johnson, and Castaldo 2009), even though customer relationships are primarily with the salesperson than with the firm (Beatty et al. 1996). Studies on trust in business relationships show that each business partner's propensity to trust stems primarily from direct experience with the exchange partner (Dwyer and Lagace 1986).

On the basis of our findings, we derive the following proposition[4]:

Proposition 3: A lack of trust in the SC perceived through smart service interactions cannot be compensated for with a good image and reputation of the service provider company.

Interdependence Between Trustworthiness and Control Perceptions

In addition to tools that provide transparency and control, the interviews show that trust in the SC can decrease the need for control. Therefore, control beliefs are strongly affected by the degree of the user's confidence in the service technician. For example, as a user (R.7) noted:

> With [company name] I don't worry, I trust their people and only afterwards I look if anything changed. But with another provider it's different. I am on alert during the whole process and always think about what [the service technician] might do just now.

In turn, if users perceive a high level of control, they tend to be more open to try interactive smart services independently of the relational bond established with the SC. For example, as a user (R.4) noted:

> I think I could trust the technician but this does not matter in respect to whether we will use these services. The moment we have the power to check the log-in protocols and know exactly what he is doing we will use the services. It does not matter then whether my colleagues or I think the technician is a good person. If he is doing well during the service we have proof and then can begin to build a relationship.

In organizational science and management literature, trust and control refer to highly complex forms of social relationships that are interrelated to each other (Anderson and Narus 1990). We show that the trust–control nexus also exists on an interpersonal level. On the basis of our findings, we propose the following:

Proposition 4: The level of desired control over the SC's actions and the perceived trustworthiness of the SC are dependent on each other in such a way that (a) greater trustworthiness of the SC leads to lower desire for control over the SC and (b) greater control leads to lower importance of trustworthiness of the SC in forming the user's attitudinal and behavioral responses to smart interactive services.

Social Presence as an Antecedent of Trustworthiness and Control Perceptions

Users favored the personal contact with their SCs and liked to work with those they knew. The interviewees conveyed the need for social contact and interaction with the SC (e.g., by telephone during a machine repair). For example, a production manager noted (R.9):

> Well, yes, I miss the personal contact, because I've liked every one of the guys they've sent in here.

In addition, users tended to prefer an SC with whom they were acquainted, especially when an emergency occurred. Closely tied to the users' need for social interaction and the way personal contact is presented in a service process is the perception of social presence of a SC—that is, the extent to which an interactive smart service allows users to experience the SC as being virtually present. From the interviews, we found that a high degree of social presence helps build trust. Verbal communication, videoconferencing, or the provision of information about the SC (e.g., a photo) seemed to be appreciated by some users (R.22; R.9):

> We think via a telephone call it is easier to communicate with them. We feel that they are more closely with us.

> If I know you and the next time you call or I call you, I have a face to put with the voice and it just makes it more. . .. Even if I knew some of the men . . . it makes it a little bit easier for me to make me feel comfortable with them.

In addition, users viewed the communication with the SC not only as social interaction but also as a tool to control the SC. A higher social presence gives the customer the opportunity to feel more in control over the SC and his or her actions. As a general manager of a printing company (R.4) stated:

> I would like it better . . . if there is always a simultaneous telephone dialog taking place to check on [the SC's] actions.

Recent studies have shown that perceptions of social presence affect user trust in websites (Cyr et al. 2007) and serve as an enabler for trust-building cues (Gefen and Straub 2003). However, research has not yet shown how the level of social presence influences control and trust perceptions on an interpersonal level such as within an SC. Thus, we propose the following:

Proposition 5: The perception of social presence during smart service provision (as reflected in the desire for social contact and communication) helps build trust between the user and the SC and also leads to a decreased need for control.

Collaborating Through Technology-Mediated Interaction

Smart interactive services are intensively coproduced by both the user and the SC. The interviews suggest that a user's collaboration beliefs (i.e., the user's own attitude toward collaboration with the SC) are important drivers of his or her attitudes and behaviors toward the smart interactive service. Collaboration beliefs mainly pertain to different facets of motivation to collaborate: ability and willingness. The majority of interviewees claimed to be willing to collaborate. Some users were honored to help in the remote repair process and believed that they could speed up the process by sharing their knowledge. For example, one user (R.26) noted:

> I like that I have to help the engineer. I feel appreciated and I am happy that he values my support and knowledge. I think that without me, the remote repair would not be effective.

Regarding users' beliefs about their own ability to collaborate, a key factor is their perceptions of their role in the smart service (i.e., role clarity). In smart interactive service settings, role clarity reflects the user's knowledge and understanding of how and when participation is needed to support the SC. This factor is important especially when the user must support the SC by performing certain tasks. In general, users appreciated guidance from the SC, which provided them with a clear image and high-role clarity about what was expected during the interactive service. For example, as one user (R.9) stated:

> It's very easy. And I'm very comfortable with the equipment. I have been running the equipment for a while, so I'm comfortable doing that. It's easy. They take me through it step by step. They are not asking me to take the machine down into a lot of little pieces. But they are asking me to do the things that I should be able to do on this end.

In contrast with users, smart service provider employees frequently mentioned users' doubts about their self-efficacy and the ability to perform in a smart interactive service. For example, one sales manager from a smart service provider (R.8) indicated:

> I believe that especially inexperienced employees of our customers have fears of using smart service technology.

In technology-mediated service situations, self-efficacy beliefs become more important than in face-to-face service encounters because they pertain to both the actual task and the mediating technology. A user's perception of self-efficacy with respect to information systems has been shown to influence usage behavior (Agarwal, Sambamurthy, and Stair 2000; Hsu and Chiu 2004). In addition, role clarity, role ability, and motivation are important drivers of compliance behavior in health care services (Dellande, Gilly, and Graham 2004) and trial of self-services (Meuter et al. 2005). However, the studied participation beliefs refer to a coproduction process that is solely defined by interaction with a machine, such as in self-services, or without an immediate interaction partner. We propose that the users' general attitudes toward smart interactive services are closely tied to their views on the interpersonal technology-mediated collaboration in the service delivery. Therefore, we derive the following proposition[5]:

Proposition 6: The collaboration beliefs (as reflected in willingness to collaborate, perceptions of role clarity, guidance, and self-efficacy) positively influence the user's attitudinal and behavioral responses to smart interactive services.

Discussion

Theoretical Contributions

Using our conceptual analysis and two empirical studies, we explored customers' perceptions of and behavior toward a technology-intensive service type that has not been delineated and discussed in literature before. We contribute a typology of four smart service types to better capture how technology-mediated services can be differentiated by customer and provider activity. From this groundwork, we identified and established the importance and future relevance of smart interactive services in various industries, such as mechanical engineering, health care, and ICT.

Our qualitative approach elicited and identified shared mental constructs and beliefs that have become part of users' understanding of the relationship between them and their SCs in a human real-time collaboration through smart service technology. This departs directly from research on personal face-to-face services in which contact and interaction are visible and comprehensible for the customer (e.g., Bitner 1990). We found that beliefs about the control over the SC, along with beliefs about the trustworthiness of the SC and the collaboration with the SC, emerge jointly as important influencers of attitudes and usage behaviors. Control and trustworthiness beliefs are interrelated and influence each other in such a way that (1) greater trustworthiness of the SC leads to lower desire for control and (2) greater control leads to lower importance of trustworthiness of the SC in forming user responses. Social presence beliefs decrease customers' needs for control and, at the same time, increase trustworthiness beliefs. This is in contrast with prior research, which has neglected the importance of control beliefs of customers regarding their SC. Prior work has focused more narrowly on trust in face-to-face service encounters (e.g., Crosby, Evans, and Cowles 1990) or on control over technical processes often in e-commerce settings (e.g., Collier and Sherrell 2010). Our comprehensive framework extends and combines these streams; for example, we extend acceptance models stemming from the technology acceptance model literature (Davis 1989) and the interactive service framework by Bolton and Saxena-Iyer (2009).

Managerial Implications

The market for smart interactive services will substantially grow over the next years, affecting both B2B and B2C domains. These services require the management of three important areas: customer collaboration, SC behavior, and technology. The findings of this qualitative study contradict common practices in smart service providers' approaches to influencing customers' attitudes and behaviors in which the tendency is to focus on the technology features (e.g., improving the interface or usability of the smart service technology). Although smart services are provided with no direct face-to-face contact, a provider's sole focus on technology features and a user's acceptance of the technology itself are not enough to influence the user's attitude and increase usage behaviors. For managers, our framework can be used as a checklist of factors that need to be accounted for when managing smart interactive service experiences.

Users perceive smart interactive services as risky because of the nonobservable nature of the services. As a result, users seek assurance from the SC during the service. Our analysis highlights several factors regarding users' beliefs about the SC that firms can address and manage, which may affect user attitudes.

When interacting with users, SCs should gain their trust through competence and benevolent behavior. Benevolent and competent behavior can to some degree be conveyed through technology, for example, by providing the user with the ability to track, log, and document provider actions or by letting the user observe behavior through videoconference. In addition to measures that affect the technology-mediated interaction, personal meetings, or telephone calls are effective to maintain a level of trust and retain strong bonds with users, even if the issues could be resolved remotely. Users initially emphasize the need for personal contact with their SC, show a strong preference for face-to-face services, and like to work with SCs with whom they are already familiar. Control beliefs can be managed by informing and empowering users. An abort button or a similar type of "emergency feature" to disconnect the access of the provider on the user's smart object is relatively easy to implement. Proxy control could be enhanced with mechanisms in which the user confirms the SC's actions during the ongoing service. In addition, the lack of transparency that interviewees often mentioned can be addressed by more extensive reporting of service incidents and the solutions provided.

Overall, the smart interactive service experience should be personalized as much as possible to raise the social presence in the encounter. Compared with standard computer-mediated environments that do not allow for nonverbal cues, such as gestures or facial expressions (Rogers and Lea 2005), the high-touch computer-mediated environment of smart interactive service allows for different levels of social presence. To raise customers' confidence in the SC's skills and to foster personal bonding, firms could provide additional background information about the actual SC, for example, a photo, a biography, a report on professional history, or certificates available through the intelligent product's display. In addition, users should have the opportunity to access additional communication channels to reach the SC during the smart interactive service (e.g., through chat functionality, telephone calls, or videoconferencing).

Firms should train and provide additional guidance to the SCs, even though they are not frontline employees in a traditional sense, to improve their social interaction skills in a technology-mediated service setting. It is important to motivate and engage customers to participate in smart interactive services. Managers need to find ways that convey mutual benefits and reduce self-efficacy and ability doubts. The role of the customer must be clearly defined, and appropriate guidance to the customer should be offered. Not all customers are equally willing to coproduce; therefore, providers must strive to identify these different user segments and shape their service portfolio accordingly.

Future Research Agenda

Our framework gives rise to several research areas that should be explored in the future. Because our work is conceptual in nature, we call for empirical validation of our findings in a variety of interactive smart service contexts. Key questions regarding control, trustworthiness, social presence, and collaboration beliefs lend themselves to a quantitative analysis of the relative strength of the proposed effects in our framework and their interactions. We summarize the direct questions that follow from our framework in Table 4. In the next three subsections, we derive concrete directions for further research that target different adoption stages, cultural differences, and other smart service contexts.

Table 4. Future Research Questions.

Control	What kind of tangible and intangible features (buttons, control panels, mechanisms, and processes) increase or decrease customer control beliefs?
	What influences the perceived transparency of a smart service process? Will increased transparency reduce customer risk perceptions?
	Where is the best balance between necessary provider control (e.g., to guarantee uptime) and perceived customer control (e.g., to abort a process)?
Trustworthiness	How do customers judge the trustworthiness of a SC? What are the dimensions and drivers of trustworthiness in a smart service context?
	How can trustworthiness perceptions be affected before, during, and after a smart interactive service interaction?
SC trustworthiness versus reputation of firm	Do spillover effects between the perception of the SC and the brand occur?
	How strongly is the trustworthiness of the SC affected by the brand image and the reputation of the provider?
	How does the performance of the SC influence customer attitudes toward the service provider?
Control versus trustworthiness	Where is the ideal trade-off between enforcing trust building and offering control mechanisms in order to raise customer perceptions?
	Does this trade-off change if the customer experiences a service failure?
	Does the provision of control mechanisms automatically lead to a higher perception of trustworthiness?
Social presence	Which media are best suited to establish social presence of the SC in a smart interactive service context?
	To what extent does social presence increase trustworthiness and decrease risk perceptions in a smart interactive service context?
Collaboration beliefs	How can provider and customer companies increase the user's motivation to collaborate in a smart interactive service?
	Should role descriptions during a smart interactive service provision be formally fixed or freely negotiated?
	Is customer collaboration always beneficial for the service provider?
	Do customers become more satisfied and loyal as their self-efficacy increases, or is there a point at which loyalty decreases because the customers are able to conduct the tasks themselves?

Applications Across Acceptance Stages

Additional insights can be gained by examining different forms of usage, such as first-time usage/trial or repeat usage. Our study aimed to provide a holistic set of factors that drive user responses by gathering information from both interviewees who had already adopted and interviewees who had not yet adopted a smart interactive service. However, we found indications that some factors in the framework are more or less important depending on the acceptance stage.

Whereas the control beliefs seem to be consistent over different acceptance stages, other factors change with respect to their importance. For example, our data suggest that trust in the service provider company or the brand is relatively more important than trust in the SC in the initial adoption stage. We also found indications that continued users of smart interactive services worry less about self-efficacy and role clarity than inexperienced users. Previous research has not explored these issues in detail, and thus we call for further research to shed more light on the differential impact of our framework's drivers across different stages in the adoption process.

Applications Across Cultures

Though outside the main scope of this study, several hints about cultural differences emerged during the coding and analysis process. We found two extreme views of attitudes toward collaboration in smart interactive services expressed by users from China and Germany. In general, the German interviewees were less coproduction oriented; they felt uneasy about taking on responsibility. For example, they often did not feel obliged to help in the coproduction by opening a machine cabinet or exchanging spare parts. In contrast, in most of the Chinese interviews, users described the collaboration process as being tightly connected with an experience of knowledge sharing and worthwhile accomplishment.

These differences in the willingness to coproduce might stem from cultural differences (Mattila 1999), and researchers have explored the effects of culture on related constructs, such as consumers' service expectations, trust building, general service evaluations, and reactions to the service experience (e.g., Zhang, Beatty, and Walsh 2008). Our data are inconclusive; interviewees from the United States also seemed to voice sentiments in the vein of the Chinese interviewees. This does not reflect differences in cultural values, for example, as Hofstede (2001) suggests. Thus, research should explore further whether and to what extent differences in the users' desire for appreciation, knowledge sharing, effectiveness, and transparent allocation of responsibilities within smart interactive services are based on cultural values.

Applications to Other Smart Service Contexts

This research focuses on smart interactive services, but the resulting framework of drivers raises managerially and theoretically relevant research issues across and within other types of smart services. Taking the smart service interactivity matrix as a beacon, it is conceivable that changes in the customer and/or provider activity of a service alter the relative importance of the identified drivers. Further research is warranted to explore how the drivers identified in our framework change their importance for different smart service types. For example, how does the role of social presence change across different types of smart services?

Our study also yielded some clues that customers and providers might have different views on the smart interactive services and potential drivers and barriers. For example, service providers and users differ in their risk perceptions and in the value they attribute to the smart interactive services. Customers are often unwilling to pay extra for these services, arguing that providers also benefit through travel cost reduction and increased flexibility. Further research might help providers that offer smart interactive services for free during warranty shift such services from free to fee.

In conclusion, we feel that smart interactive services offer a plethora of fruitful research avenues that go well beyond the aforementioned themes. Just as technological advances revolutionized basic service types over the last decades, it is inevitable that the same will happen for these more complex, interactive, and smarter services. We encourage researchers to take part in these exciting developments and actively further our understanding not only in new aspects of these services but also in the reverberations this has for service science.

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Notes

1. In the following, we use the terms service counterpart (SC) and human interaction partner interchangeably to refer to the service provider employee who interacts with the user in the service process.
2. Although considerable discussion continues on the exact meaning of "customer coproduction," "collaboration," "cocreation," and other related terms, most researchers agree that varying levels of customer participation in service production and delivery are unique and important aspects of service experiences from both a theoretical and a managerial perspective.
3. In the following, we write the references to interviewees in shorthand, with R. X representing the respondent number as listed in Table 1.
4. Notably, this is a proposition for which the supporting statements come predominantly from users with more experience (see Table 3, column 6). Although the difference in trial and continued usage is not the focus of this study, we elaborate on some of the implications in the "Discussion" section.
5. Our results indicate that ability beliefs, including self-efficacy, guidance, and role clarity, play a more important role for less experienced users. In addition, beliefs regarding a user's willingness to collaborate may vary between cultures. Although the difference in acceptance stages or cultures is not the focus of this study, we elaborate on some of the implications in the "Discussion" section.

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