

# REMOTE SERVICE SATISFACTION: AN INITIAL EXAMINATION

*Completed Research Paper*

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## **Abstract**

*As more providers establish remote services for remote repair, remote diagnosis and maintenance purposes to provide greater value to their customers, understanding what creates a satisfying customer experience becomes crucial. Even though this understanding appears crucial, no studies have examined the factors that make customers satisfied with remote services. To partly fill this void, the authors examine the role that customer perceptions of (1) remote service technology, (2) remote service workflow, (3) economic value, (4) information exchange, (5) interaction, (6) remote service individualization, and (7) auxiliary services play in customer remote service satisfaction assessments. They find that remote service technology, remote service workflow, and interaction are the dominant factors in customer assessments of satisfaction. The authors discuss the implications of these findings and offer directions for future research.*

**Keywords:** technology-intensive services, remote services, satisfaction, empirical research

## Introduction

During the last decade, services industries were subject to considerable changes with respect to the way services are provided, delivered, and conceived (Bitner et al. 2000; Curran and Meuter 2005; Dabholkar 1994). These changes in markets, customers, and technologies are enabling new business models, capabilities, and products, such as the infusion of services, into goods-dominant firms, products co-created with customers or network partners, and offerings customized to customer behavior observed over time (Marketing Science Institute 2010). The increasing employment of information technologies alters not only the nature of services and their delivery process (Bitner et al. 2000), but also the interaction at the interface between service providers and customers (Bhappu and Schultze 2006; Colby and Parasuraman 2003; Zeithaml et al. 2006). These technologies enable service transactions over the internet and the generation of services without establishing personal contact.

Remote services constitute such an emerging type of technology-mediated service in the business-to-business context. A study conducted by the consulting firm McKinsey & Co. estimated that 11 percent of service jobs around the world could be carried out remotely (Farrel et al. 2005). Particularly in high-technology industries such as IT, medical healthcare and mechanical engineering, remote services are established instruments that are often used for remote repair and remote diagnosis and maintenance (Biehl et al. 2004). These services significantly change the delivery process of services, since they are provided in an interactive technology-mediated production process, exclusively allowing the service providers to access and modify the service object over long distances. For example, medical equipment vendors such as Siemens complement the offerings for their customers with remote services for the maintenance of high-tech equipment (e.g. computerized tomography (CT) scanners). Via IT-infrastructure customer's machines and systems are remotely connected to the service provider. These connections allow permanent real-time remote monitoring of the interconnected objects. In the case of technical problems or system irregularities detected by remote monitoring, the service provider is alerted. Immediately, a service provider engineer located overseas remotely accesses the customer's system, in this case the CT-scanner, in a hospital in the U.S., to diagnose and remotely repair system failures from a distance, without involving the customer's engineer or sending a local field-service engineer to the hospital. In about 50 percent of situations problems can be remotely solved before they cause more serious damage, e.g. the cooling of a machine can be intensified before technical devices overheat.

Although remote services constitute an emerging type of technology-mediated service and they are predicted to become the fastest growing technology-driven IT service within the next years (DuBay 2009), surprisingly, little empirical research has been conducted to examine customer perception of remote service technologies that are used and delivered in business-to-business settings (Parasuraman 1998; Pujari 2004). Remote services have the potential to be beneficial for both service providers and customers based on their increased flexibility regarding the service delivery, time savings in problem solving and cost reductions concerning traveling costs for technicians and unplanned system failures. Despite these potential advantages, the acceptance among customers is still fairly low. As more providers offer their customers remote services, understanding what creates a satisfying experience becomes crucial. Although the antecedents to customer satisfaction are well documented in classical contexts (Oliver 1997; Szymanski and Henard 2001; Yi 1990), customer satisfaction in a remote services context has not been subjected to conceptual or empirical scrutiny. More specifically, no systematic research into the determinants of remote services satisfaction has been conducted. No research has been conducted even though the findings from such studies would add value to strategies designed to augment remote services satisfaction and guarantee that remote service customers will be satisfied. Against this background, remote services are considered as a major research priority and therefore researchers call for more empirical studies (Ostrom et al. 2010).

Hence, our objective is to provide initial evidence for the determinants of remote services satisfaction. We examine and document the role of (1) remote service technology, (2) remote service workflow, (3) economic value, (4) information exchange, (5) interaction, (6) remote service individualization, and (7) auxiliary services in customer remote services satisfaction assessments. We rely on qualitative evidence gathered through in-depth interviews to develop a conceptual model which includes determinants of remote services satisfaction. We then test this model across users of remote services in a second B2B industry. We close the study by discussing implications of the findings and directions for future research.

## Conceptual Background and Literature Review

Remote services represent a unique type of service which can be defined as a service which is provided in a technology-mediated production process independent of the physical separation of the customer and provider. Hereby, the service object is remotely modified via control and feedback devices. One can distinguish between three types of remote services. While the first type describes simple remote services which only need limited integration of the customer in the service delivery process, the second type includes interactive remote services which are provided via technology-mediation to a connected service object in a collaborative production process based on a high level of human-to-human interaction between an active provider employee and an active customer employee. Besides these two types of remote services, the third type of remote services focuses on the proactive prevention of service failures. These proactive remote services can be defined as unidirectional technology-mediated services enabling the service provider to preventatively monitor, diagnose and repair physically separated service objects, ideally without human-to-human interaction and customer collaboration. With respect to the service characteristics one could further describe these three types in terms of intangibility of the service, inseparability, complexity, level of automation, degree of standardization, customer integration, type of interaction, heterogeneity of the outcome and perishability. Figure 1 summarizes the characteristics of the three types of remote services.

Constitutive service characteristics	Remote Services	Interactive Remote Services	Proactive Remote Services
<b>Service contact / interaction type</b>	technology-mediated	technology-mediated	technology-mediated
<b>intangibility</b>	intangible process with tangible and intangible outcomes	intangible, but tangible outcome likely	Mostly intangible, but tangible outcome likely
<b>inseparability</b>	no co-location required	no co-location, but necessity for synchronicity	no co-location required, no necessity for synchronicity
<b>complexity</b>	low-high	high	low-high
<b>level of automation</b>	low-high	low	low, real-time monitoring
<b>possibility of standardization</b>	low-high	low	low
<b>integration of external factor</b>	mostly connected service objects	mostly connected service objects and active customer co-production	mostly connected service objects, without active customer co-production or collaboration
<b>type of interaction</b>	human-to-human, human-to-machine, machine-to-machine	human-to-human real-time interaction and collaboration	human-to-machine, machine-to-machine
<b>heterogeneity</b>	low-high	high	high
<b>perishability</b>	low-high	high	high

**Figure 1. Classification of Remote Services**

Little literature is available that is specifically concerned with remote service technology. There are various technical reports focusing on the technology advances (DuBay 2009) or case studies such as Jonsson et al. (2008). The latter authors explored the value creation process with ubiquitous computing and its influence on businesses in the manufacturing industry. They found out that remote diagnostic systems can serve as a basis for the value creation process (Jonsson et al. 2008). A further study from the field of operation management examines remote diagnostics as integrated solutions based on case studies. This study focuses on the development of integrated solutions and the collaboration between provider and customer. The authors concluded that the value of integrated solutions derives from the customer-provider co-production process (Brax and Jonsson 2009). But there is little empirical research that goes beyond descriptive case study research.

Related streams of research have shown the advantages and the potential of new service technologies to provide better services (Bitner 2001b; Colby and Parasuraman 2003), although there are also downsides to technology that have been addressed by researchers. Mick and Fournier (1998) identified eight 'paradoxes of technology' showing that technology can trigger positive as well as negative feelings. It can, for instance, lead to control and at the same time to chaos, or it can facilitate activity and involvement,

whilst it can concurrently lead to passivity and disconnection (Mick and Fournier 1998). With respect to remote service technologies it is important to investigate the customers' perception of this particular technology and to identify potential barriers to its successful implementation.

Similarly, Parasuraman (2000) points out that "the nature of company-customer interactions is undergoing fundamental transformations with far-reaching implications for both companies and customers" (p. 307). Remote services limit or replace the human contact and face-to-face communication between service organizations and their customers. This new form of technology-mediated interaction generates unexpected challenges, both for the service providers and for their customers (Zeithaml et al. 2002). Especially in B2B relationships, interpersonal factors fulfill important roles (i.e., information exchange, assessment, and social roles) (Bhappu and Schultze 2006; Leek et al. 2003; Turnbull 1990). Exactly these interpersonal exchanges are also central factors that determine the success of the respective services, give impressions of service quality (Bitner 1992; Gremler and Gwinner; Parasuraman et al. 1985), and support the development of strong personal relationships with an organization (Grönroos 1990; Parasuraman et al. 1985). But the employment of technology also creates "boundaryless relationships and low-friction transactions, exchanges and business operations" (Ostrom et al. 2010). For the above stated reasons it is imperative to understand how service technology changes business relationships and to analyze how the transformation from close personal contact to technology-mediated interaction will affect customer satisfaction.

Although remote services constitute an emerging type of technology-mediated services, surprisingly, little empirical research has been conducted to examine the complex and technology demanding remote service technologies that are used and delivered in business-to-business settings (Parasuraman 1998; Pujari 2004). Motivated by the apparent gap in the literature, we focus in our research on the exploration of the determinants of remote service satisfaction in business-to-business encounters.

## **Conceptual Model**

The basic idea behind this study is to explore the still largely unexplored and new phenomenon of remote service technology and its satisfaction drivers. Qualitative research seemed to be appropriate for this study as it is supposed to investigate new and unknown phenomena and their influences so as to generate new theories from the results (de Ruyter and Scholl 1998; Denzin and Lincoln 2005; Maxwell 2007; Patton 2009; Silverman 2010a). The openness and flexibility of this method allows the research design and focus to be continually modified during the research process in order to facilitate understanding of new findings and relationships (Maxwell 2007; Patton 2009). "Qualitative research provides an in-depth inside; it is flexible, small-scale and exploratory, real-life-like and full of ideas" (de Ruyter and Scholl 1998, p. 8).

## **Data Collection**

This research has been realized in close cooperation with a manufacturer and remote service provider from the healthcare sector. This global company and medical solution seller produces high-tech medical equipment for hospitals and at the same time offers maintenance of the machines and systems in the form of remote services on different contractual levels. The company employs around 48,000 individuals globally and is represented in over 130 countries. In fiscal 2010, the company generated sales of € 12.4 billion and earnings of € 750 million in the healthcare sector. The empirical study has been conducted in the field of diagnostic imaging due to the fact that this field comprises cutting-edge technology and remote services as well as proactive remote services are implemented to monitor, diagnose and repair radiology systems such as Magnetic Resonance Imaging Scanners (MRI) or Computerized Tomography Scanners (CT). The empirical data collection consisted of focus group research and qualitative in-depth interviews. Two online focus groups with participants from 9 different US hospitals were set up to collect initial insights into possible satisfaction drivers from different stakeholder perspectives.

The next steps were the personal in-depth interviews. The interviewees are selected using Patton's (2009) purposeful sampling: "Purposeful sampling focuses on selecting information-rich cases whose study will illuminate the questions under study". The choice of potential interviewees takes place in three steps. The countries which seem relevant for this study and in which interviews are to be conducted have been identified in cooperation with the remote service provider. The USA (the largest market), Germany (the

domestic market) and Sweden (due to particular legal conditions) have been chosen. The selection process follows Patton's (2009) intensity sampling approach. The aim of this approach is to select particularly high-content, relevant cases without concentrating on extremes.

Following the selection of country, the hospital where the interviews take place is chosen. The online focus groups provide evidence that there is a particular lack of perception of the use of remote services in large clinics. Focus is therefore placed on large clinics as an analysis unit. The selection process follows the criterion sampling approach (Patton 2009) here. A clinic's size criterion is determined by the number of beds, workers and remotely controlled medical systems. The previously defined criteria serve to assure quality in the interview material (Patton 2009). It therefore seems prudent to select clinics in which the majority of systems are equipped with remote service technologies in order to warrant a certain degree of experience in using the services.

In the third step, interviewees are identified in the defined hospitals. Six categories of buyers in medical decision-making have been identified: physicians, nursing, administrators, technicians, administration, purchasing, and engineering (Polley and Shanklin 1983). Nowadays these units include people with business responsibilities to ensure medical, operational, and clinical/administrative perspectives (Lindgreen et al. 2009). As remote services are a technology-intensive and complex service, the interviewees have to have a certain level of technical knowledge. They should also be familiar with a specific form of remote services - proactive services - in order to be able to describe and compare typical maintenance services to this special proactive form. The third criterion relates to the interviewee's position in the company or hospital. Friedmann et al. (2000) found that chief executives had greater influence on purchasing decisions compared to other decision-influencers (Friedmann et al. 2000), therefore interview partners should be in a management position since these positions have interfaces to various other departments and divisions and, as such, the use of remote services can be brought to light from various perspectives.

During a one year period 25 qualitative interviews were personally conducted with 20 remote service customers and ten employees of remote service providers in three countries (USA, Germany and Sweden) at eleven different hospitals.

The data was primarily collected through personal in-depth interviews, observations and informal conversations. The interviews were always conducted in the respective interviewees' working field in their familiar working environment. Furthermore, the relevant departments were always visited. These were usually the radiology departments at the hospitals and the technical IT areas since a direct connection to remote services is made there. During these visits the employees were introduced, the different systems and devices presented and their function was explained in great detail. In some clinics it was possible to follow medical procedures on screens. During these tours, presentations and informal discussions, the participants often gave more important information or suggestions regarding remote services. These statements were then noted down and included in the analysis (c.f., Patton 2009; Silverman 2010b).

In general, interviews lasted from 60 to 120 minutes, and followed an informal interview guide focused on eliciting information about the interviewee's position in the organization, their general perception about remote service technology and particular changes to processes before and after the implementation of the technology as well as likes and dislikes of remote services. Questions are then asked about general satisfaction and perceived service performance in a critical incident technique style (Flanagan 1954). Critical incidents are especially useful for evaluating services in a marketing context: "This method is adopted to identify the sources of both satisfactory and dissatisfactory service encounters from the customer's point of view" (Bitner et al. 1990, p. 72). Almost all interviews were recorded and transcribed. Two interview partners refused to have their interviews recorded. In these cases, detailed notes were made or a minute-taker was invited to attend.

## ***Data Analysis***

The huge amount of data collected and the mix of different language in the texts require an analysis method which systematically analyses large data volumes and supportively integrates into the interpretation process (Alam 2005; Fielding and Lee 1993; Maclaran and Catterall 2002; Rettie et al. 2008; Weitzman and Miles 1995). A computer-supported evaluation (CAQDAS) is especially suitable to handle the large amount of data (Alam 2005; Craig and Douglas 2001; Sinkovics et al. 2005).

GABEK (holistic processing of complexity) is a software package and serves to organize knowledge and coding processes. The interviewees' personal views are interlinked by GABEK, overlaid and put in order. The GABEK computer-supported process is especially suitable for processing people's experience, knowledge and attitudes and organizing and representing knowledge. Notes, quotes, texts or entire fields of knowledge can be compressed to a network of opinions which interlinks opinions, experiences, knowledge, values and emotional attitudes in the form of "terminology graphs", "linguistic forms", "form trees", "effect networks" and "evaluation profiles". Like maps, they make appropriate orientation possible across the entire landscape of opinions. The depth structure becomes transparent such that relationships can be understood, options evaluated, goals defined and trends detected early. GABEK therefore makes it possible to recognize and depict complex relationships and links employees', customers' and decision-makers' knowledge together into a coherent whole. GABEK's aim is "to obtain a holistic integrated view of individual aspects of the particular investigated 'situation' (e.g. opinions and attitudes)" (Buber and Kraler 2000, p. 112). The coding process followed an inductive approach of category development where "categories or dimensions of analysis emerge from open-ended observations as the inquirer comes to understand patterns that exist in the phenomenon being investigated". The researchers "seek to understand the multiple relationships among dimensions that emerge from the data without making prior assumptions" (Patton 2009, p. 56). The data has been analyzed by three researchers in an iterative process. 799 texts units – which include one or more sentences – were finally related to seven categories and 33 subdimensions. The quality of the coded judgments is verified by the proportional reduction in loss (PRL) reliability measure reflecting the consensus of the judges (Rust and Cooil 1994). In our study the PRL is .931 and can be considered as good because it is higher than the suggested minimum of .8, therefore intercoder reliability can be assumed. The identified categories will be presented and synthesized with results from existing literature in the following section.

## Development of Research Propositions

In this section we present the seven categories that determine satisfaction with remote service technology from a customer and provider perspective. We have chosen to consider both groups to validate the results of our analysis as there are no considerable differences between the groups. Seven categories emerged from the analysis of the in-depth interviews and can be defined as follows: (1) remote service technology, (2) remote service workflow, (3) economic value, (4) information exchange, (5) interaction, (6) remote service individualization, and (7) auxiliary services (see Table 1). It was interesting to observe that customers of remote service technologies were generally dissatisfied with the technology, since 65.5 percent of the coded sentences were negatively evaluated.

Table 1. Determinants of Remote Service Satisfaction		
Frequency	Category	Definition
723	RS Technology	<i>RS Technology</i> refers to the usefulness of the technology and comprises technological benefits and drawbacks of remote services as well as advantages and disadvantages perceived by the customer.
191	Workflow	<i>Workflow</i> refers to the way remote service processes are executed regarding the system monitoring, diagnostic, maintenance, and repair. The remote service technology is designed to increase the process efficiency for service provider and customers.
604	Economic Value	<i>Economic Value</i> refers to the relative advantage of the service technology and includes capacity utilization due to higher uptime of the systems, time savings due to faster support and the pricing of the services reflected in different service level agreements.
536	Information Exchange	<i>Information Exchange</i> refers to the service provider's information policy towards service customers, e.g. to what extent customers are informed about providers' activities and in how far the process is transparent to them. Information also includes the 'evidence of service' and the documentation of service failures in system histories.

617	Interaction	<i>Interaction</i> refers to the reciprocal exchange between service provider and customers including regular communication, the development of interpersonal relations and the integration of the customer in the service production process.
326	Individualization	<i>Individualization</i> refers to customers' wish for individual treatment in a remote service encounter, particularly in emergency situations.
144	Auxiliary Services	<i>Auxiliary Services</i> refer to the fact that customers and users of remote service technology expect to receive training to use the technology in a proper way and further learn to detect and solve problems on their own.

### **RS Technology (723)**

The interviews show that customers generally value the remote service technology and consider these services an essential and indispensable requirement for operating high technology products in the very competitive health care industry. The technology offers benefits for the customer such as higher availability and reliability of the machines, quick access for problem diagnostic and 24/7 support from the remote service center. Companies also save labor and travelling costs for field service engineers that are substituted by the technology. These advantages are already shown for self-service technologies (Dabholkar and Bagozzi 2002; Meuter et al. 2000), but become even more crucial in B2B settings.

*“Remote access, remote service is all about proactive intervention. Leading the service team to solutions before they become reactive service people” [satisfied]*

[IC:M24].

*“They knew immediately when it happened and they called us and they fixed it right away. That's the type of stuff we are looking for. 80-90% of the problems can be fixed easily within half an hour, without the end users even knowing that there was a problem. That's what you want. You want to find something and get it fixed before anybody calls you. And that's the promise you get to.” [satisfied]*

[IC:Bo7]

Customers mentioned data security and higher risk due to the permanent remote connection as major concerns in remote service encounters. Customers further admit to being overwhelmed by the technology's complexity even though they have a technical background and lot of experience with high-tech equipment. Particularly studies about self-service technology show that the ease of use of a technology can lead to customer satisfaction (Ding et al. 2010; Meuter et al. 2000).

*“One disadvantage of course is that you have to open up your network in some way. And every time you have the network open you have the possibility for someone to get in and do something that's not good for you, of course, that's the problem. And you also, it depends on, all vendors have the same problem, that to open up, you have to open up a lot, it's not just to open this small part to that vendor, you have to open up much.”*

[IC:Q07]

The majority of customers agreed on the two biggest advantages of remote services: On the one hand the opportunity to prevent unplanned downtimes and on the other hand fast reaction and problem solving on the part of the provider. The unnoticed remote actions of the provider and the technical concerns due to remote connections demonstrate that remote services are not only associated with advantages to the customer.

Thus,

**H1** *Satisfaction with remote services increases as perceptions of RS technology become more positive, all else equal.*

## **Interaction (617)**

Interaction is aimed at the two-way communication between service provider and customers, and focuses on mutual exchange and reciprocal interaction. Customers currently see a lack of communication with the provider that fosters the negative perception of the service technology. The intangibility of the service and the lack of communication during the delivery have a negative impact on customer satisfaction. Customers stated that ongoing communication facilitated the remote service performance and the provider's actions, meaning that customers could better understand the technology if their benefits were communicated in the most preferable way, namely personally, which would again lead to less uncertainty and a lower perception of risk.

*"With the non-personal, the non face-to-face you can, I mean, it may be technically correct, but you still don't know why. The explanation maybe somewhere underlines what remote services are, but when you are face to face the guy has got to give you the answer. If he doesn't know the answer he doesn't know the answer. Technically he may understand what the problem is."* [dissatisfied]

[IC:K30]

*"I'm not really scared of it, I'm leery of it, I hate telephone systems, you know, punch 2 for this, punch 3 for that. You know, sometimes I like talking to a live person. And I think a lot of people do, because that's just human nature. [...] The human interaction is probably the best part of [remote services] I just don't want some computer printout saying we're sending you these parts because you need them to replace in here because we've seen an issue."*

[IC:K58]

Insights from self-service technology literature reveal that the wish for personal contact impacts upon the customer's behavior when using these technologies (Bateson 1985; Dabholkar 1996). The fact is that the desire for or rejection of personal interaction in service performance affects the usage of self-service (Dabholkar and Bagozzi 2002; Walker et al. 2002; Zeithaml and Gilly 1987), depending on the customer's preference for "tech" or "touch" (Makarem et al. 2009; see also Gallagher 2002). In comparison to technology, people are more trustworthy, better able to correct mistakes and have the ability to react appropriately to problems, so a higher-quality result can be achieved (Dabholkar and Bagozzi 2002).

Particularly proactive remote services can be produced without customer co-production. This concept is to some extent contradictory to current research about customer integration. Through their involvement in the service performance, customers are in a position to have a direct influence on the quality, satisfaction and value of the service (Bitner et al. 1997). *"The role of the consumer in the industrial system has changed from isolated to connected, from unaware to informed, from passive to active"* (Prahalad and Ramaswamy 2004, p. 4; see also Blazevic and Lievens 2008). Vargo and Lusch's service dominant logic (SDL) also supports this shift from being a co-producer to a co-creator of value (Vargo and Lusch 2004, 2006, 2008). Remote service customers express their dissatisfaction:

*"No, I would like to be involved. I think there is a benefit to, again, I would think that belongs to the relationship, I mean, why not allow me to be part of that process? Why does it have to be separated? So, I want to be a co-producer of the service, yes, that's my concept. And I don't know if everybody feels that way, but that's my opinion."* [dissatisfaction]

[IC:A49]

Therefore,

**H2** *Satisfaction with remote services increases as perceptions of interaction become more positive, all else equal.*



### **Economic Value (604)**

Remote services were critically examined from an economic point of view. Hospitals recognize the importance of service technologies for keeping their high-tech equipment running. If systems are available, hospitals are assured of a certain patient and income flow through the system, which in turn keeps them highly competitive. Customers expect the technology to protect them from financial losses; and they also want to see that costs for the technology do not exceed the inactivity losses and expenses, inter alia, created by remote services as otherwise there is no economic advantage to the customer.

*“Well, if I spend 10,000 dollars a month, does it save me 10,000 dollars? I don't want to spend 10,000 dollars for a security blanket, to feel like somebody's looking over my shoulder. That 10,000 dollars, you would have to prove to me how it saves me 10,000 dollars.” [dissatisfied]*

[IC:A62]

*“So, then of course, when you have to pay a lot of extra money for function it is always a question of okay, do you really want to do this or maybe we can manage without it, and so that's the economical part of it, I think, the cost factor.” [dissatisfied]*

[IC:O40]

The most important economic factor for customers is the time saving aspect realized through remote services. This finding is supported by Meuter et al. (2000) who empirically showed that time savings belong to the most satisfying incidents in self-service encounters.

*“Less downtime. That's what this is all about. Downtime or uptime, more uptime less downtime, that would be the way to look at it. Is the glass half full or half empty? But they achieve better uptime by the fact that we have remote diagnostics.” [satisfied]*

[IC:E09]

Thus,

**H3** *Satisfaction with remote services increases as perceptions of economic value become more positive, all else equal.*

### **Information Exchange (536)**

The information exchange category is focused on providers' information behavior and how customers are informed about remote service actions. Customers perceive the service technology as intransparent. Intransparency may drive the customer's uncertainty regarding the service performance, the provider's actions, and may result in a higher risk perception focusing in particular on access to the machines and the stored data. It also complicates the customer's quality and value perception. With traditional face-to-face services, the evidence of service (Bitner 1993) was more obvious to the customers. They could observe the activities done by the provider's technicians on their systems. Service employees' behavior gave a first impression of the service quality (Parasuraman et al. 1988). Now, in a remote context, the evidence of service is still important from the customer's viewpoint, although it is more complicated to provide and this fact may have a negative impact on the overall satisfaction.

*“The best thing I can tell you is, when it's transparent you're successful.” [dissatisfied] [IC:M24]*

*“I think it's really important that the provider shows evidence to the customer of how this actually works by actual events, and maybe even in places where it's implemented, and they have these actual events recorded that they can tell the provider to call this particular person, see how they like the remote service.” [dissatisfied]*

[IC:B56]

Therefore,

**H4** *Satisfaction with remote services increases as perceptions of information exchange become more positive, all else equal.*

### **Individualization (326)**

An unexpected result in the qualitative interviews is the customer demand for individualization and special treatment in remote service encounters. The quotations demonstrate that service customers no longer experience individual treatment due to standardized service technology. Remote services consist more or less of routines and, consequently, customers complain that providers treat them all in the same way. But especially in a case when a customer's organization pays a large amount of money for the service technology, exceptional and preferred treatment is expected, particularly in emergency situations.

*"... and this is going to sound so arrogant what I'm saying, but there are different levels of service courses. If you get a call from inexperienced technologists that have only had the system for a month, there is a different quality from somebody who is been doing it for 30 years and has the equipment for five years. Because I think what happens is everybody gets into the same category. [...]. It's your call and you always get asked the same questions, it doesn't matter who calls, and it's always treated the same way." [dissatisfied]*

[IC:A52]

*"And the other thing too, and this is more a personal level, if that person comes here and sees that the waiting room is full and I am in a panic, as opposed to somebody 300 miles away, that is totally disconnected, there is a different urgency to the problem." [dissatisfied]*

[IC:A20]

From literature on relationships and service encounter research it is known that customers experience three kinds of relational benefits, namely, 'confidence', 'social and special treatment benefits' (Gwinner et al. 1998). The special treatment benefit is defined as *"the benefit of the doubt, being given a special deal or price, or getting preferential treatment"* (Zeithaml et al. 2006, p. 184). Empirical evidence has proven that relational benefits influence loyalty, recommendation behavior and commitment toward the organization and satisfaction with the service provider (Gwinner et al. 1998; Hennig-Thurau et al. 2002).

Hence,

**H5** *Satisfaction with remote services increases as perceptions of individualization become more positive, all else equal.*

### **RS Workflow (191)**

Remote service workflow refers to the process and delivery of remote services as well as procedures that are influenced by the technology. Process failures lead to customer dissatisfaction regarding service technologies and might influence the future usage of the technology (Meuter et al. 2000). From customers' descriptions one can draw the conclusion that the remote service workflow has not yet reached its full potential. Compared to traditional services, customers have higher expectations where process efficiency is concerned. There are still some difficulties in the coordination of online and offline services and it would appear that customers are more likely to excuse human failures than technological malfunctions.

*"I would think probably, you know, one of the toughest things is resolving an issue, following it through to the end, arise an issue, it gets addressed, it gets worked on. But if there is not a solution, sometimes what happens is the problem just remains and there is no follow-up to see why it's not resolved.*

*Sometimes one of my biggest concerns is that the burden is put back on me to do the follow up. [...]"*  
*[dissatisfied]*

*[IC:A09]*

*"Where it doesn't work well is when it becomes, for whatever reason, a difficult or complicated issue, that it seemed to go through the normal process, there seems to be a point where it stops, which is okay. But then nothing else is done and nobody gets back to me to say, you know, some kind of a time line, of what could I expect or even some kind of an action print to say, we have done this and we expect to do that. It just kind of seems to store or stop at that point. And then it's up to me to go back and try to get this service to explain what the problem was. I feel it would work better if the service contacted me and explain what the problem was."* *[dissatisfied]*

*[IC:A09]*

Thus,

**H6** *Satisfaction with remote services increases as perceptions of RS workflow become more positive, all else equal.*

### **Auxiliary Services (144)**

Customers' actions sometimes contribute to a dissatisfying service outcome (Meuter et al. 2000) because they are not able to handle the technology properly. At this point they need additional help and support from the service provider or want to be trained on the equipment. Customers' wish for training clearly demonstrates the complexity of remote services and at the same time the motivation of customers to be integrated into the service process and to understand the development of the service. Customers show great interest in advanced learning and professional education with regard to service technology and technological developments. This leads to the assumption that customers' technicians recognize that learning and training are two important aspects in technological environments and necessary for users of high-tech equipment if they want to remain competitive and avoid being overwhelmed by technology. Additionally, with proper learning and knowledge, customers are in a better position to solve problems on their own which would ease the dependency on the provider. Customers could regain a certain level of autonomy and control over technological processes. It can be assumed that customers want to avoid customer-driven failures that are shown to influence their overall satisfaction with the technology (Meuter et al. 2000).

*"I understand that, I try to work with that occasionally, but because I'm not a [provider] employee they won't let me into it [the system], but I have gone to the training and I understand what those logs mean and how to access the remote services. I wish I could get more because it would be easier."* *[dissatisfied]*

*[IC:K03]*

*"The better trained the local engineers are on the equipment, the more experience they have and their ability to take that information and effect a speedy repair, they're worth their weight in gold to me. All of the technology in the world, if it isn't used properly is worthless."* *[dissatisfied]*

*[IC:M13]*

Therefore,

**H7** *Satisfaction with remote services increases as perceptions of auxiliary services become more positive, all else equal.*

## Method

### Data Collection

Although the qualitative study represents the main study of our research, we decided to conduct a second quantitative study to give initial evidence for the proposed determinants of remote service satisfaction and to contribute to a better understanding of their relative importance. Therefore, we have chosen a second industry in which a software provider has established remote services to remotely repair and remotely diagnose failures for its B2B customers. Examination of a second industry increases reliability of our findings. The data for our second study was collected via personal interviews by a trained interviewer during four weeks in January 2011. In total, 147 B2B customers participated in our survey. The respondents are on average 36 years old (SD = 11.38) and have used this remote service for 3.2 years (SD = .62). According to the descriptive statistics above, the sample is comparable to the population of all customers of this provider.

### Measurement and Questionnaire Development

Overall satisfaction with remote services is measured by adapting three commonly employed measures of satisfaction: general satisfaction, conformation of expectations, and the distance from the customer's hypothetical ideal product (Fornell 1992). The items for capturing the performance of the provider in terms of remote service technology, remote service workflow, economic value, information exchange, interaction with customers, remote service individualization, and auxiliary services are grounded in our qualitative data. We developed measures capturing each of these determinants. Exploratory factor analysis (principle components analysis with varimax rotation) confirms the identified seven determinants. In our qualitative interviews, the customers frequently mentioned technical features, reliability, availability, service center personnel, and access to the important elements of the perception of remote service technology. Moreover, they argued that concept, workflow, follow-up, and customer's workflow belong to remote service workflow. Elements of economic value include time aspects, costs of remote services, and the perceived value. Information exchange consists of transparency, notification, evidence of services, and documentation. Elements of interaction are communication, personal contact, involvement, co-production and control, and the human factor. The individualization of remote services entails individual treatment, prioritization of customers, and service providers' tailored knowledge. Finally, the auxiliary services include training, learning and improvement. Therefore, all these elements are captured in our survey items which are outlined in Table 2.

<b>Table 2. Reliability and Validity of the Constructs</b>			
Scale/Item	CA	CR	AVE
Overall satisfaction (1 = strongly disagree and 5 = strongly agree)	.88	.81	.82
Performance ratings on (1 = poor job and 5 = excellent job)			
– Remote service technology	.80	.87	.57
– Remote service workflow	.72	.83	.54
– Information exchange	.81	.87	.64
– Economic value	.82	.89	.74
– Interaction	.86	.90	.65
– Remote service individualization	.83	.90	.75
– Auxiliary services	–	.93	.87

Most items were measured using five-point-Likert-type scales with anchors of 1 = poor job and 5 = excellent job (except overall satisfaction: 1 = strongly disagree and 5 = strongly agree). Measurement

reliability of the reflective constructs was examined through a confirmatory factor analysis. It can be noted that composite reliabilities (CR) for all constructs exceed .6, the generally recommended threshold (Bagozzi and Yi 1988). Moreover, discriminant validity between the constructs is given, since none of the squared correlation coefficients between any of the constructs exceeds the average variance extracted (AVE) for a construct (Fornell and Larcker 1981). Results of correlation analysis are depicted in Table 3.

Construct	1.	2.	3.	4.	5.	6.	7.	8.
1. Overall satisfaction	1							
2. Remote service technology	.60	1						
3. Remote service workflow	.41	.39	1					
4. Information exchange	.47	.48	.61	1				
5. Economic value	.62	.58	.36	.42	1			
6. Interaction	.44	.62	.50	.60	.34	1		
7. Remote service individualization	.44	.49	.33	.52	.37	.78	1	
8. Auxiliary services	.57	.60	.57	.57	.61	.66	.68	1
AVE	.82	.57	.54	.64	.74	.65	.75	.87

## Results

Multiple regression analysis was used to estimate the impact of remote service technology, remote service workflow, information exchange, economic value, interaction, remote service individualization, and auxiliary services on the customers' levels of remote service satisfaction. The results of multiple regression analysis are presented in Table 4.

Predictor Variable	Proposed Effect	Stand. Coefficient	t-value (p-level)
Remote service technology	+	.32	5.02 (<.01)
Remote service workflow	+	.18	2.86 (<.01)
Economic value	+	.16	2.80 (<.01)
Information exchange	+	.06	1.00 (>.10)
Interaction	+	.16	1.75 (<.10)
Remote service individualization	+	.13	1.66 (<.10)
Auxiliary services	+	.13	1.65 (<.10)
F-value (p-level)	36.85 (<.01)		
R2 (R2 adjusted)	.49 (.47)		

Before testing our hypotheses, we examined the extent of multicollinearity, which was tested using variance inflation factor (VIF). All VIF values are below the critical boundary of 4 being discussed in literature (Hair et al. 2006), following that our data has qualified for further analysis. The data in Table 6 show the regression coefficient for information exchange is not statistically significant. However, the coefficients for remote service technology, remote service workflow, economic value, interaction, remote service individualization, and auxiliary services are statistically significant. The signs of these independent variables also display the expected direction. Furthermore, our results indicate that remote service technology has the greatest impact on remote service satisfaction ( $B = .32, p < .01$ ), followed by remote service workflow ( $B = .18, p < .01$ ), economic value ( $B = .16, p < .01$ ) and interaction ( $B = .16, p < .10$ ). Remote service individualization ( $B = .13, p < .10$ ) and auxiliary services ( $B = .13, p < .10$ ) display a

moderate impact on remote service satisfaction. Overall, this model explains 47 percent of the dependent variable's variance. Except hypothesis 4 (information exchange), every hypothesis is supported by our findings.

## Summary and Managerial Implications

Multiple regression analysis was used to estimate the impact of remote service technology, remote service workflow, information exchange, economic value, interaction, remote service individualization, and auxiliary services on the customers' levels of remote service satisfaction. The results of multiple regression analysis are presented in Table 7.

Even though satisfaction is central to increase competitiveness of new technology-mediated services, no research has examined the determinants of remote service satisfaction. One objective in this study was to begin to fill this gap in the literature. To this end, we document that (1) remote service technology, (2) remote service workflow, (3) economic value, (4) information exchange, (5) interaction, (6) remote service individualization, and (7) auxiliary services have a significant influence on remote service satisfaction levels (note that information exchange was found to be of importance in study 1 but it was not significant in study 2). We further document the relative magnitude of these effects. The relevance of the findings to current thinking and practice are discussed next.

First, customers being confronted with *remote service technology* expect the software to be easy to handle and to install otherwise they are not able to employ their full potential (c.f., Gordon et al. 1993). The ease of use of remote services is shown to influence the customer's satisfaction (Davis 1989). Remote access should be safe and manageable for users; this is why some of them prefer to control the provider's access to their systems and would like permission to be requested, or to have a possibility to shut down the remote connection at any time. As far as the field service engineer and the remote service center employees are concerned, interviewed customers stated their wish for one and the same contact person whom they could contact directly in emergency situations. This would give customers the opportunity to establish a closer relationship with the people in charge. They also admitted that both the service personnel and the technicians are important in a remote setting. It is important for the service provider to improve the efficiency between on-site technicians and online support, particularly at the technology-human interface, so as to ensure smooth remote processes.

Second, *remote service workflow* was found to contribute to remote service satisfaction. The basic concept of remote services is to increase process efficiency on both the customer and the provider side. Due to the fact that some shortcomings are still observed by the customers, they expect a closer look at the whole service workflow to eliminate problems, particularly on the part of the provider. Based on our interviewees' statements it can be recommended that remote service providers should advance their process efficiency through seamless operations and quick response to customers' problems.

Third, customers expect the remote services provider to be excellent in terms of *economic value*. Although remote services are created to be beneficial to both service provider and customers, customers are not fully convinced of the service potential due to the intangibility of the remotely delivered services. Customer need to see the benefits of the service technology to be able to evaluate prices and high costs. Customers need a demonstration of remote services in action to understand their capability. Service providers should also give their customers a better understanding of their pricing models to increase price awareness and sensitivity for their remote services.

Fourth, *information exchange* represents an important determinant in study 1 (but not in study 2, maybe because of the context in which they do not want to be "bothered" by the provider). In study 1, customers strongly insist on regular information exchanges with their service provider regarding remote service activities on their systems. This exchange would on the one hand provide more transparency about the activities and processes running primarily in the background and, on the other hand, provide detailed information enabling customers to assess the remote service performance as well as to check whether the agreed contracts had been fulfilled. The information on particular service events could be summarized in service reports, and collected and edited in a knowledge base (c.f., Zolkiewski et al. 2007). If problems occurred, customers would have access to this knowledge and might solve problems on their own.

Fifth, *interaction* between customer and provider is a further source of satisfaction. Customers largely expect to communicate with their service provider via several communication channels, e.g. via telephone, email, or video chat. Service providers should especially offer the possibility for face-to-face communication to establish a more personal contact and closer relationship to the service provider employees. The service experience should be personalized as much as possible to support the trust building between providers and customers. It is suggested to foster this personal bonding by providing background information on the remote service technician such as a photo, CV, reports on his service history or qualification certificates.

Sixth, providers should consider *remote services individualization*. The individual treatment in technology-mediated service encounters seems to be of high significance for remote service customers. Interviewees mentioned several aspects that need further improvement. Most important, providers have to develop a sense of urgency particularly in medical settings and they need to set up emergency plans so that their customers receive individual treatment even in emergency situations. Moreover, the customer expects individualized benchmark statistics to compare capacity utilization among the equipment or within departments of the customer's organization. Furthermore, the provider should integrate the customer into the process of service improvement for instance by collecting customer feedback and assessing preferences.

Finally, *auxiliary services* represent an important area of improvement. Some customers are highly motivated to be integrated in the service production and delivery process. Nevertheless, special skills and expertise are necessary to make use of them, and consequently customers expressed their wish to receive proper training on the remote technology. Customers desire more individual training that is adequate for their systems and the applied remote technology. According to this idea, customers suggest initiating regular round table meetings with several stakeholders in the remote technology as well as involved persons from the provider's organization to review the service performance and develop strategies together.

Our study indicates that among these seven determinants, remote service technology, remote service workflow, and interaction are the dominant factors in customer assessments of satisfaction. By improving the remote services with respect to these determinants, the provider would significantly contribute to value creation.

## Directions for Future Research

The following directions for further studies were derived from the limitations of our investigation as well as the desire to gain further insight into the antecedents and outcomes of remote service satisfaction:

- The qualitative exploratory interview study was conducted in the healthcare sector so that, in consequence, only one industry was the subject of this qualitative phase. This fact may lead to the assumption that the results are industry-specific and cannot be transferred to other industries such as engineering or the automotive industry. In our research, we have chosen a second B2B industry to validate the identified dimensions of remote services (software provider offering remote services to remotely repair and remotely diagnose failures for B2B customers). Nonetheless, we encourage future research to examine remote services in further industries especially in business-to-consumer industries.
- Studies should also examine customer expectations towards remote services prior to purchase and the associated (dis-)confirmation after consumption (Oliver 1980). Such a differentiated approach would further contribute to a better understanding of how to provide value to customers and increase satisfaction.
- After identifying the determinants of remote service satisfaction, literature is lacking a quantitative large-scale assessment of the determinants. Besides examining overall satisfaction as a dependent variable, future research might also examine the impact of remote service satisfaction on outcomes such as word-of-mouth, customer loyalty and customer complaints.
- Examining whether the determinants of remote service satisfaction hold across all types of customers has merit. Studying whether remote service satisfaction is stable over time might also

be of interest. If it is inherently unstable or ever changing, then strategies designed to increase satisfaction levels must also have a dynamic component. Longitudinal research is called for to examine such issues.

- Finally, identification of moderator variables affecting the efficacy of remote service satisfaction might contribute to literature. It is unclear whether customer characteristics (e.g. involvement, company size), relational moderators (e.g. relationship age), or marketplace characteristics (e.g. competitive intensity, convenience of offering) affect the link between remote service satisfaction and customer loyalty (Seiders et al. 2005).

Research pursuing these and other directions that become apparent as knowledge builds is encouraged. It is encouraged in the context of ultimately developing a comprehensive understanding of the antecedents and outcomes of remote service satisfaction. The research reported represents an initial step toward accomplishing this goal.

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