

Nancy V. Wunderlich

## **Acceptance of Remote Services**

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Nancy V. Wunderlich

# **Acceptance of Remote Services**

Perception, Adoption, and Continued  
Usage in Organizational Settings

With a foreword by Prof. Dr. Florian von Wangenheim



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**RESEARCH**

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# Foreword

The way services are conceived, developed, and delivered has changed considerably in view of the recent advances in information and communication technologies. New "intelligent products" contain IT in the form of microchips, software, and sensors and are able to collect, process, and produce information. The continuous data flow from embedded IT-applications enables seamless services delivered in real-time and directed at connected objects. In this environment, remote services are quickly emerging as a new class of fascinating technology-mediated services.

The number of remote service offerings has grown enormously in recent years and is expected to be the fastest growing technology-driven service type over the next decade. Remote services are highly complex, depend on mediating technologies, and require human-to-human interaction. One of the greatest challenges in this realm has proven to be the interplay between the drivers and barriers of customer adoption and acceptance, especially since remote services are predominantly found in heterogeneous B2B-environments. Theories of technology adoption that are well established in literature tend to focus mostly on the technology itself as the primary determinant of adoption and usage. This was sufficient for more basic types of services such as self-, or e-services but falls short with more advanced services in organizational settings.

Thus, this dissertation is very important from a theoretical perspective. Nancy Wunderlich developed and validated a new model – the ITSUM – that forms a sound theoretical base for explaining intended and actual use of interactive remote services and can be used to predict actual service usage. The ITSUM introduces additional constructs including trust in and control of the 'service counterpart', and aspects of customer co-production behavior like role clarity, ability and intrinsic motivation. By incorporating the 'human element' into the model, Nancy Wunderlich contributes to the underlying theory and increases overall understanding of the phenomenon. She also shows that the predictors of remote service usage vary across groups, depending on whether the respondent's company is in the early stages (pre-adopter) or already a user of remote services (continued usage).

A major strength of the dissertation is its conceptual, theoretical, and qualitative work that precedes the rigorous quantitative testing of the ITSUM model. The model is very well supported by the data, but equally important it is also strongly supported by an extensive, inter-disciplinary

literature review and a careful, detailed, and deep qualitative interview study conducted in Germany, USA and China.

This work is also critically important from a practical perspective. Helping organizations to understand the underlying drivers of customer acceptance and adoption of new types of services is of paramount interest not only in competitive dynamic markets but also to advance the organization itself. Nancy Wunderlich derives clear and concise managerial implications for remote service providers on how to increase remote service acceptance among their customers and facilitate the export of remote services.

In sum, this is a remarkable thesis that substantially enhances the theoretical understanding of remote services as well as serving as a guide for managerial practice. Nancy Wunderlich has already been honored with several national and international awards – e.g., IMS & AMA SERVSIG Dissertation Proposal Award 2009, Doctoral Proposal Award of the Society for Marketing Advances 2008, Young Career in Service Science Award of the BMBF 2008, ASU/Liam Glynn Scholarship Award 2007 – for her dissertation proposal.

I highly recommend this book to academics and practitioners who are interested in the management and marketing of innovative, technology-based services.

Florian v. Wangenheim

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I am deeply grateful to Mary Jo Bitner for the long discussions that helped shape the direction of this work, and of my career. Mary Jo has always been there to listen and to offer indispensable advice. She has shown faith in my work from the start and has been a ceaseless advocate for me throughout the project and beyond. My truly memorable time with her, as a visiting PhD scholar at the marketing department of Arizona State University, will have a lasting impact on me.

I want to thank the members of the service science community for creating a stimulating and friendly atmosphere that widened my scientific understanding in many respects. In particular, I thank Professors Ruth Bolton, Stephen Brown, Michael Ghoul, Hartmut Holzmüller, Amy Ostrom, Kay Lemon, and Ralf Reichwald for the lively discussions and for their insightful and encouraging comments.

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Nancy V. Wunderlich



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# List of Abbreviations

ACN	Automatic Collision Notification
AIC	Akaike Information Criterion
AOL	America Online
APS	Automated Phone System
ATM	Automatic Teller Machine
ATT	Attitude
AVE	Average Variance Extracted
B	Behavior / Usage Behavior
B-A-I	Belief Attitude Intention
B2B	Business-to-Business
B2C	Business-to-Consumer
BD	Business Development
BIC	Bayesian Information Criterion
BVDM	Bundesverband der Druck- und Medienunternehmen (German Printing and Media Industries Federation)
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
CI	Causal Inference
CMV	Common Method Variance
CONT	Control / Controllability
COSE	Customer Oriented Skills of an Employee
CR	Composite / Construct Reliability
CRM	Customer Relationship Management
CSR	Customer Service Representative
CTC	Customer-Technology Contact
df	Degrees of Freedom
DTPB	Decomposed Theory of Planned Behavior
e-brokerage	Electronic Brokerage
e-commerce	Electronic Commerce
e-coupons	Electronic Coupons

e-government	Electronic Government
e-health	Electronic Health
e-learning	Electronic Learning
e-payment	Electronic Payment
e-tax	Electronic Tax
e-vendor	Electronic Vendor
e.g.	exempli gratia
ECT	Expectation Confirmation Theory
EFA	Exploratory Factor Analysis
EOU	Ease of Use
et al.	et alii
ETC	Electronic Toll Collection
etc.	et cetera
ExFeD	Export Ferngelenkter Dienstleistungen (Export of Remote Services)
EXP	Expertise
exp.	Expected
f.e.	For Example
FD	Factor Determinacy
FMS	Flexible Manufacturing System
FTU	Facilities Transformation Usage Framework
GATF	Graphic Arts Technical Foundation
GM	General Manager
I.	Interview Number
i.e.	id est
ICT	IT Continuance Model
IDT	Innovative Diffusion Theory
INT	Intention
IRCAD	Institute for Research of the Cancer and Digestive System
IS	Information System
IT	Information Technology
ITSUM	Interactive Technology-Mediated Service Usage Model
Jr.	Junior
KBA	Koenig & Bauer AG
LMS	Latent Moderated Structural Equations
loc	Locus of Causality
M.I.	Modification Indices
MAN	Maschinenfabrik Augsburg Nürnberg AG

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MIS	Management Information System
ML	Maximum Likelihood
MLM	Maximum Likelihood Parameter Estimate M
MLR	Maximum Likelihood Parameter Estimate R
MOTIV	Motivation
n.s.	Not Supported
OLS	Ordinary Least Squares
P	Participant Number
p.	Page
p.s.	Partially Supported
PA	Proportional Agreement
pb	Prior Behavior
PC	Personal Computer
PDA	Personal Digital Assistant
PL	Perreault and Leigh Measure
PRL	Proportional Reduction in Loss
PU	Perceived Usefulness
RA	Role Ability
RC	Role Clarity
RMSEA	Root Mean Squared Error of Approximation
RRDM	Remote Repair, Diagnosis and Maintenance
RS	Remote Service
RSPC	Remote Service Provider Company
RST	Remote Service Technician
s.d.	Standard Deviation
s.e.	Standard Error
SAT	Satisfaction
SCT	Social Cognitive Theory
SEM	Structural Equation Modeling
SME	Small and Medium-Sized Enterprises
SN	Subjective Norms
SRMR	Standardized Root Mean Squared Residual
SSTs	Self-Service-Technologies
T	Trust
t-commerce	Tele Commerce
TAM	Technology Acceptance Model
TLI	Tucker-Lewis-Index
TPB	Theory of Planned Behavior
TR	Technology Readiness

TRA .....	Theory of Reasoned Action
TRAM .....	Technology Readiness into Technology Acceptance Model
TRI .....	Technology Readiness Index
TT .....	Trust in Technology
TW .....	Trustworthiness
URL .....	Uniform Resource Locator
USA .....	United States of America
UTAUT .....	Unified Theory of Acceptance and Use of Technology
VDMA .....	Verband Deutscher Maschinen- und Anlagenbauer (German Engineering Association)
VIF .....	Variance Inflation Factor

# Chapter 1

## Introduction

### 1.1 Motivation and Goals of the Thesis

*"Service encounters are critical moments of truth in which customers often develop indelible impressions of a firm. ... Yet, across industries, technology is dramatically altering interpersonal encounter relationships." (Bitner, Brown, and Meuter 2000, pp. 139)*

The increasing employment of information and communication technologies in companies and households has not only led to considerable changes in the way services are conceived, developed, and delivered, it has altered the nature of services themselves (Bitner, Brown, and Meuter 2000; Meuter et al. 2000). The convergence of technologies such as e-commerce, ubiquitous computing, and mobile communication is emerging as a promising new paradigm with the goal to provide services anytime, everywhere, and transparently to the user via devices embedded in the physical environment. New "intelligent products" contain IT in the form of microchips, software, and sensors and are able to collect, process, and produce information (Rijsdijk, Hultink, and Diamantopoulos 2007). Network technology embedded into such devices allows for connecting these objects to producers and customers enabling automatic identification, localization and remote sensor technologies (Jonsson, Westergren, and Holmström 2008; Lyytinen and Yoo 2002). This poses not only technical, social, and organizational challenges for product producers. It also has a strong impact on possibilities for service provision as the continuous data flow from embedded IT-applications enables seamless services delivered in real time, and directed at connected objects (Fano and Gershman 2002).

In this environment, remote services are quickly emerging as a new class of fascinating interactive services. Remote services are predominantly applied as remote system administration, remote diagnosis, and remote repair of machines in organizational environments and high technology industries such as IT, automotive, and engineering (Biehl, Prater, and McIntyre 2004).

An illustrative example in the field of mechanical engineering is the remote repair of a high volume printing machine. A service provider engineer located in Germany remotely accesses a printing machine in China to diagnose and solve a complex machine failure. He then interacts with a customer employee located at the machine in China to repair it remotely, jointly, and interactively while being thousands of kilometers apart. During the whole process, the service provider's and customer's employees are interacting and collaborating in a completely technology-mediated contact situation.

The application fields of remote services are predicted to expand in scope and scale and become the fastest growing technology-driven IT-services within the next few years (Stiel 2004). The increasing application of remote services in business-to-business (B2B) settings foreshadows the tremendous impact this new technology will have on consumers as well. For example, remote surgeries have already been successfully conducted (Sila 2001). Just recently, Intel and General Electric announced a joint venture on telemedicine to market and develop applications to track the daily activities of patients in need of remote monitoring (The Wall Street Journal 2009). Remote control, repair, and diagnosis of car electronics are offered in the high-end luxury car segment (Chatterjee et al. 2001). Remote control of household amenities such as heating and water (Baker 2008) will change the way provider companies access our lives and raise new challenges in establishing security, trust, and protection of consumers' privacy (Jons-son 2006).

The implementation of remote services is expected to result in substantial efficiency gains on both the provider's and the customer's side, due to cost reductions, increased flexibility and time savings. For example, remote services in mechanical engineering help to substantially reduce travel and personnel cost up to 20–30% and the time of troubleshooting up to 10% (Borgmeier 2002). To maximize the benefits for the organization, it is crucial for remote service providers to increase the usage rates by attracting new customers and retaining users. Even though the opportunities are attractive for service providers and customers alike, remote services are associated with substantial challenges and barriers (Biehl, Prater, and McIntyre 2004; Wunderlich and Pfeffer 2007), for which neither practitioners nor academics have found an ideal solution. Even in lead industries like mechanical engineering, the acceptance rate is fairly low. Only about 28% of all companies used remote services in 1997; since then the acceptance rate has only marginally improved (Borgmeier 2002; Stolz 2006).

In view of the increasing importance of remote services across industries, it is remarkable that there is no available research that goes beyond descriptive case studies of individual remote service applications. It is also significant that there is a lack of systematic research on the perception and acceptance of remote services. Further, studies on related services only capture a fraction of the relevant characteristics for understanding remote services. For example, studies on the effect of customer provider interaction and co-production on service perception are currently limited to services delivered via face-to-face encounters (e.g., Bendapudi and Leone



2003; Bettencourt et al. 2002). Research on less complex and less demanding services like e-services and self-services mostly focuses on technology features as antecedents of (service) technology acceptance (e.g., Lin and Hsieh 2006; Featherman and Pavlou 2003). These partial approaches might be sufficient for their respective domains, but they fall short for interactive remote services where both the co-production with a service provider employee and the interaction through a mediating technology are essential for the service experience. Hence, to comprehensively analyze the remote service concept, this thesis links separate streams of literature from the fields of service marketing, inter-organizational relationship management, and information systems (IS) research.

The dissertation will contribute to theory by providing a holistic classification of remote services and interactive remote services. Moreover, this thesis explores the customer's perception of these services and identifies drivers of organizational usage. A model to explain adoption and continuance, the ITSUM, is developed. Ultimately, this thesis aims to derive managerial implications for remote service providers on how to increase remote service acceptance among their customers.

Customers' acceptance of remote services in a B2B setting does not only manifest in a first-time remote service usage decision instead it is embedded in business processes of repeated practice. Researchers criticize the extreme emphasis of acceptance (initial use) over continued usage in technology and technology-intensive service acceptance studies (Baron, Patterson, and Harris 2006; Bhattacharjee 2001). Baron, Patterson, and Harris (2006, p.111) call it "the inadequacy of a concentration on simple acceptance ... where technology is embedded in a ... community of practice." Support for this view comes from findings in relationship marketing, which also stress the need to retain existing customers (Grönroos 1990; 1996). Researchers claim that the importance of continuance is evident from the fact that acquiring new customers may cost as much as five times more than retaining existing ones given the costs of advertising, searching for new customers, setting up new accounts, and initiating new customers (Parthasarathy and Bhattacharjee 1998). Therefore, this thesis strives to provide a comprehensive approach of explaining both initial acceptance (adoption) and repeated, continued usage (continuance) of remote services in organizations.

From a methodological perspective this thesis aims at explaining organizational intention by linking it to perceptions of individual employees as a proxy. In addition, this doctoral research seeks evidence for the predictive power of organizational intention on actual usage behavior of organizations. Therefore, an empirical setting is chosen where intra-firm group decision making processes are minimal and individual personal attitudes and intentions can be related to organizational behavior.

## 1.2 Research Questions

This doctoral research comprises different empirical studies that use both an exploratory and a confirmatory approach. The exploratory qualitative study is guided by the following fundamental research questions: <sup>1</sup>

1. What benefits and obstacles of remote service stand out from a customer's point of view?
2. How do customers perceive a remote service situation?
3. What factors determine the general acceptance of remote services?

Within this thesis, I identify major belief groups that influence the intention of an organization to use interactive remote services. Building on these findings, my quantitative studies further explore the following research questions:

1. Do the identified beliefs affect an organization's intention to use interactive remote services and, if they do, to which extent?
2. Do the identified beliefs affect an organization's intention to continue to use interactive remote services and, if they do, to which extent?
3. How do the determinants of behavioral intention differ between organizations with few and organizations with more experience with interactive remote services?
4. Does the intention to use interactive remote services predict actual usage behavior of organizations and, if it does, to which extent?

## 1.3 Structure of the Thesis

This thesis employs a multi-methodological approach: it links conceptual, qualitative and quantitative research studies and aims at getting profound and accurate insights through triangulation. Therefore, the structure of this thesis follows the analytic procedure of the studies as shown in figure 1.1. Eight chapters comprise the dissertation.

CHAPTER 2 is dedicated to the conceptualization and classification of remote services. Extant literature on new emerging technology-mediated services across industries is reviewed, remote services are characterized, and a demarcation between remote services and interactive remote services is given. Interactive remote services are discussed in comparison to self-services and face-to-face services. The reason why interactive remote services form a unique and distinct service type from both a theoretical and practical standpoint is outlined.

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<sup>1</sup> The research questions will be refined in the context of the individual empirical studies presented in chapter 5 and 7.

1	<b>Introduction</b>
2	<b>Conceptual Framework</b> Classification of (Interactive) Remote Services
3	<b>Theoretical Background</b> Innovation and Technology Adoption, Services Marketing, Relationship Management, B2B-Marketing Literature, Organizational Adoption
4	<b>Empirical Setting</b> Structure of the Studies, Study Context
5	<b>Exploratory Qualitative Study</b> Framework on Remote Service Perceptions
6	<b>Model Development</b> Hypotheses for: ITSUM, Acceptance/Continuance Comparison, Intention to Use/Usage-Link
7	<b>Quantitative Studies</b> Study Design ( $t_1$ and $t_2$ -Study), Operationalization, ITSUM Validation Acceptance/Continuance Comparison, Intention to Use/Usage-Link
8	<b>Discussion</b> Summary of Results, Managerial Implications, Limitations, Future Research Implications

**Figure 1.1: Structure of the Thesis: Contents of the Chapters 1–8**

Because literature on remote services is sparse, I approach the theoretical substantiation of the study by combining different research streams. In CHAPTER 3, I present the theoretical foundations of this thesis drawing from the fields of information systems, especially studies on IT- and innovation adoption, concepts of personal customer-provider interaction and co-production from the service marketing field, and management literature on relationship management in strategic alliances. In addition, concepts of B2B-marketing and organizational innovation adoption are discussed.

In CHAPTER 4 the methodological research structure and the triangulation through qualitative and quantitative studies are outlined. These are the building blocks of the analytical framework and guide the proceedings of this thesis. The rationale for choosing the empirical setting, which is the printing industry, is explained and background information on its structure in Germany, USA and China is given.

The international qualitative exploratory study is described in CHAPTER 5 explaining the motivation, study design, and method in detail. The results of the qualitative study identify the relevant categories of beliefs that affect remote service attitudes. These are synthesized to develop a new framework for remote service perception.

Based on the findings of the qualitative study and my conceptual work, I develop the Interactive Technology-Mediated Service Usage Model (ITSUM) for measuring the interactive remote service acceptance in CHAPTER 6. Hypotheses are derived for the ITSUM, the relationship between organizational usage intention and actual behavior, as well as for the comparison of organizations in the pre-adoption phase and in the continuance phase.

The quantitative studies are described in CHAPTER 7. The first study measures remote service acceptance in the German printing industry and tests the formal hypotheses of the ITSUM derived in the previous chapter. Organizations in the pre-adoption phase are compared with organizations in the continued usage phase. A second quantitative study with the same subjects at a later point in time is conducted to validate the link between organizational usage intention and actual usage behavior. The chapter finishes with a synthesis of the quantitative results.

CHAPTER 8 combines all individual results from the studies. It connects the insights gained and presents a comprehensive summary. Managerial implications for the provision of remote services are derived. This thesis concludes with an outlook towards future research with respect to the limitations of this work.

## Chapter 2

# Conceptual Framework: Remote Services in Context of Technology-Mediated Services

New types of technology-mediated services such as e-services, mobile services, self-services, and recently remote services have become reality. In this chapter, these new service types will be defined, and their application in practice and recognition in scientific research will be discussed. This discussion will set the frame of reference for the main objects of this thesis: remote services and interactive remote services. A classification and demarcation will be given, and the unique service experience from a customer's point of view will be examined.

### 2.1 Emerging Technology-Mediated Service Types

#### 2.1.1 E-Services

In e-services, the production, consumption, or provision of services takes place through electronic networks or the Internet. These characteristics form the core of most e-service definitions given in literature that see e-services as web-based services (Reynolds 2000), as interactive services that are delivered on the Internet (Boyer, Hollowell, and Roth 2002), or generally as information services because the primary value exchanged between the two parties is information (Rust and Lemon 2001). Despite the various attempts at defining e-services, no universal agreement has been reached. This thesis follows Colby and Parasuraman's (2003, p.28) definition of e-services, because it reflects an understanding common to a majority of researchers:

E-SERVICES are "all services delivered via an electronic medium (usually the Internet) and comprising transactions initiated and largely controlled by the customer."