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Information Technology Use by Providers of Person-Oriented Services: Actual Usage and Acceptance Issues in Health Care

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Abstract

In order to develop service design methods for IT-enabled person-oriented services, it has to be analyzed to what extent IT is in use today, as well as which acceptance issues of implementing new IT-based innovations play a vital role. In this paper, we focus on service providers in health care since they face significant challenges due to the demographic shift, including cost increases, uneven quality standards and limited resources to provide the ageing population with adequate services. The objective of this study is to explore how and to which extent IT is used in business practice as of today, as well as to present retentions and opinions upheld especially by service providers, providing a more profound understanding of IT and technology acceptance, paving the road for systematic development of IT-enabled person-oriented services.

1. Introduction

Services dominate western economies, accounting for about 70% of employment and gross value added. Moreover, services are the only part of western economies to have expanded in terms of employment in recent years, as manufacturing, mining and agriculture continue to contract (Maglio, Spohrer 2008). Especially person-oriented services bear great economic potential, although little statistical data is available for this kind of services (see e.g. (RWI 2008) for Germany). The demographic shift in industrialized countries has led to increased health care spending and a higher demand for care services threatening existing public health and welfare systems (OECD 2009). Germany, for example, spent more than 250 billion Euro on healthcare in 2009 (OECD 2009) and costs are projected to increase by 70% by 2020 (Kartte et al. 2005). Based on this background Germany is listed in the Top 10 of OECD countries for per capita expenses on health care services (Anderson et al. 2006).

In addition to social and economic consequences, health care is a field that continuously undergoes changes. The potentials of the IT-usage in business are well-known. IT leads to new forms of cooperation and communication in service systems by enabling automation, support of processes, standardization, and new concepts for customer integration (Davenport 1993). In many industrial branches innovative IT and its use are key drivers for increasing effectiveness and efficiency in production processes for goods, services and successful business processes. The use of IT also bears vast potential for services. On the one hand, IT enables new forms of cooperation and communication in service systems (Rai, Sambamurthy 2006), on the other hand it enables automation, standardization and new concepts for customer integration (Fitzsimmons, Fitzsimmons 2005). Much of service innovation is therefore about the adoption and effective implementation of IT tools (Zysman 2006).

The application of IT is different amongst service sectors though (Sheehan 2006). Especially knowledge-intense person-oriented services, e.g. health or home care, are lagging behind on intelligent usage of IT, yet they bear great economic potential. Typical person-oriented services are found in the health care sector, e.g. nutritional or health counseling. They are highly individualized, knowledge-demanding and generally delivered face-to-face. Enabling IT potentials for such services raises problems existing design methods do not address (Patrício, Fisk, Cunha 2008). This is partly due to the fact that such services face certain specific specialties, e.g. regulatory issues or retentions upheld by service providers and consumers, which leads to the prevalent notion that they are not suitable for systematic service engineering. In the case of health counseling, e.g., such specialties include that customers are sick and reluctant, relinquish privacy or are at risk (Berry, Bendapudi 2007). Yet, several new technologies have been developed and introduced, especially in the fields of ambient assisted living or telemedicine, which might lead to service innovations also in these sectors. Despite being considered economically and technically viable, few of these IT innovations have been put into practice (Cho, Mathiassen, Gallivan 2008; Essén 2009). This is also caused by a lack of methods to systematically develop economically reasonable and user-friendly IT-enabled services and processes (Patrício, Fisk, Cunha 2008).

Efforts to realize the IT-potential for health care services have already been successfully made (Leimeister, Knebel, Krcmar 2006; Leimeister, Daum, Krcmar 2002) and can be expanded upon. The effect of IT usage in healthcare is also found in medical service provisions (Schweiger et al. 2007) and administrative support processes. IT usage can be a driver for diversification in competition and the creation of innovative strategic competitive advantages in the health care sector. Multiple studies report success of IT-driven improvements in administrative and business processes, e.g. information systems for the input and integration of treatment data, reminder functions, nutrition management and medication, e.g. (Knebel, Leimeister, Krcmar 2007; Leimeister, Ebner, Krcmar 2005; Prinz, Menschner, Leimeister 2009; El Emam et al. 2009; Iglesias et al. 2009).

Additionally, the increase in AAL technologies over the last few years offers enormous potential for improving existing health care services and creating new services. AAL comprises concepts as ambient intelligence (Aarts, Wichert 2009; Kleinberger et al. 2007) or ubiquitous computing (Taylor, Dajani 2008), and is also referred to as independent living. AAL may be beneficial in supporting a patient's quality of life and, where implemented, could reduce the cost of delivering health care. Hence methods

need to be developed to systematically develop economically reasonable and user-friendly IT-enabled services and processes in health care (O'Grady et al. 2010).

In order to develop service design methods, it first has to be analyzed to what extent IT is in use today, as well as which acceptance issues of implementing new IT-based innovations on part of service providers play a vital role. We focus especially on providers of knowledge-intensive person-oriented services in health care since they face significant challenges due to the demographic shift, including cost increases, uneven quality standards and limited resources to provide the ageing population with adequate services (OECD 2009). The objective of this paper is hence to explore what how and to which extent IT is used in business practice as of today, as well as retentions and opinions upheld especially by service providers, providing a more profound understanding of IT and technology acceptance.

We start with a description of our research method for the quantitative study and present empirical results. We close with a discussion and outlook for further research.

2. Research Design

2.1. Research Method

We conducted a quantitative study. In order to structure our research objectives and questionnaire we first conducted a pre-study consisting of four expert interviews with service providers of different health care domains. In detail, two interviews were made in the field of counseling, one of them with a nutritional counselor, the other with an agency that advises older people in different aspects on how to maintain independent living. The other two interviews were conducted with home care service providers. The main goal of the expert interviews was to identify to what extent IT is used by the service providers and for which kind of service processes IT is applied. Furthermore we were interested in the general opinion of the service providers towards use of IT in service settings. The interviews were carried out in a semi structured way and lasted between 30 and 45 minutes. The results of the interviews were used as the baseline for the quantitative study. The questionnaire is also based on relevant literature on IT usage and IT/technology acceptance.

The duration of the survey was two months, starting in July 2010. The presented data is of August 2010, while the survey is still ongoing. The data was collected through a standardized online questionnaire. The questionnaire forms were pre-tested among experts and adjusted in advance where required, e.g. to linguistically fit to the professional domain terminologies of providers of person-oriented services. Address data was collected from commercially available domain-specific address data collections and internally compiled address data sets. After consolidation of address data sources, more than 2500 different service providers in the health care sector could be identified as potential participants. The service providers were selected after relevant NACE codes representing knowledge-intensive person-oriented services in health care. The average response time for the questionnaire was approximately 30 minutes. The data collection included two follow-up calls for participation through email.

2.2. Structure

After two researchers independently and iteratively conducted a data cleaning process, 126 data sets were collected from person-oriented health care providers through the online questionnaire. Almost two thirds of the respondents were either management executives (45%) or IT executives (19%), whereas the rest were staff personnel. About 40% of the participants were female, while age ranged from 25 to 66. The data sets were answered by service providers which are classified in different fields of health care services. Most respondents were from the field of home care (27%) and rehabilitation services (25%), followed by health promotion and prevention (19%) and acute care (14%). Company size was rather equally distributed, with the majority (39%) of the participants working within medium sized companies (51-250 employees). Table 1 provides an overview of the sample structure of our study.

Function:	Health Care Field of Service:					Total	
	Prevention	Acute care	Rehab	Home Care	Others		
Management	10	6	12	21	6	56	44.4%
IT-Executive	4	3	9	8	0	24	19.0%
Staff / Employee	10	8	10	5	13	56	36.5%
Total	24	17	32	34	19	126	
	19.0%	13.5%	25.4%	27.0%	15.1%		100.0%

Table 1: Sample structure of our study

When compared with data from the Federal Statistical Office, our sample is not consistent with the statistical data about German health care market structure. E.g. home care and rehabilitation service providers are overrepresented in our study, while in contrast small companies and self-employed, who comprise a large amount of the health care market, are underrepresented. This is due to the address and data collection process and the use of online questionnaires, which favours larger companies that have a greater visibility on the internet. Therefore the validity of our conclusions might be limited and the application of t-tests might be restricted. As a consequence, our study aims rather at representing fast followers and early adopters of IT than the whole market. Yet, this does not present a problem for the objective of our study, as these service companies are the ones most eligible for IT and AAL adoption and implementation within the next years.

3. Empirical Data

3.1. IT Infrastructure and use of IT in various service settings

The objective of the first part of the questionnaire was to explore what kind of IT is already installed, planned or also of no interest to service providers, as well as the actual usage within certain process steps of service provision. We asked for standard IT items as desktop PCs, notebooks, smart phones, PDAs, etc., as well as standard or individual software for certain processes like billing or customer databases.

As for the actual existence of IT, we found that most of service providers are well equipped with standard IT items. As for newly evolving technologies like RFID, sensors, or, in general AAL technologies that enable e.g. telemonitoring or remote surveillance of patients, this can hardly be found in practice. Our study hence confirms findings from the literature (Essén 2009; Cho, Mathiassen, Gallivan 2008).

Our results also show that service providers use IT mainly for administrative tasks, mainly by using desktops or notebooks. During service provision, IT is not used by almost all participants of our survey. In home care, nursing staff is equipped with cellular phones, but only to be reachable and not for documentation or similar tasks. Hence, even in this case, they do not contribute to service provision. Another interesting point is that almost every participant runs his own website, which enables potential customers to obtain information about the company and details for service provisioning. This fact is yet partially due to the limitations of our data set. However, although there are possibilities to get in touch with the service provider via email or the website, almost no participant allows direct transactions of services via his website, which in turn means that e-commerce is not existent so far in person-oriented health care services.

3.2. Overall role and value of IT

The participants were inquired for their personal estimations on the overall value of IT within their company. They could rate five different items by use of a 5-step Likert Scale, ranging from 1 („totally agree“) to 5 („totally disagree“). Additionally it was possible to give no answer. According to (Stauss 1999) the easiest and most successful method of questioning endogenous variables is to use direct questions. Therefore the participants were given the opportunity to directly rate the role of IT by items „is used to fulfill legal constraints“ and „enables competitive advantages“. For further insights into the role of IT for service providers, participants had the possibility to rate the item “without IT our company cannot survive”. This item represents an indirect value proposition for health care service providers, as IT is responsible for survival of the company without directly providing value. The item “IT is necessary to realize new business models” is used to question the role of IT as enabler. By the item “IT should only be regarded from a cost perspective”, the strategic value of IT is judged.

Question Items for overall value of IT	
V1	IT is used to fulfill legal requirements.
V2	IT enables competitive advantages.
V3	IT should only be regarded by a cost perspective.
V4	Without use of IT our company will not survive.
V5	IT helps to realize new IT-based business models.
V6	Efficient and effective IT support of business process allows increase in economic value.

Table 2: Question items for overall role and value of IT

We segmented the results by health care field of services, by the size of service providers (number of employees) and role of the participant (management executive, IT executive or staff). The results are displayed in tables 3-5. Overall the estimated value of IT for their company is rather high (V1 and V2). It can be seen, that management executives rate the perceived benefit and potentials of IT lower than average, while IT executives provide the highest ratings. Yet, among all participants there is an agreement that without IT, the companies will not survive any more (V4). This becomes evident by a mean of 1.69 over all participants and a standard deviation of 0.9. Hence it can be concluded that the need to realize IT potentials and the benefits are already recognized within the health care sector.

	Management Exec.		IT Executive		Staff / Employees		Total	
	Mean	STD	Mean	STD	Mean	STD	Mean	STD
V1	2.02	0.95	1.60	0.82	1.93	0.94	1.92	0.93
V2	2.28	1.04	1.75	0.85	2.33	1.14	2.18	1.06
V3	3.25	1.23	3.75	1.33	2.91	1.29	3.23	1.30
V4	1.93	1.05	1.33	0.70	1.58	0.72	1.69	0.90
V5	2.50	1.04	1.92	1.10	2.42	1.14	2.36	1.10
V6	1.95	0.97	1.79	1.02	1.98	0.76	1.93	0.90
Mean (max=5), STD = standard deviation								

Table 3: Descriptive analysis of overall role and value of IT, segmented by responsibility (Source: Sample data)

IT as enabler for new business models (V5) has a lower acceptance rate, and, taken into account the high standard deviation, this is obviously due to a more heterogeneous perception. A more detailed comparison of participants (Table 3) reveals, that IT executives agree more strongly to this than the other participants.

The strategic value of IT (V6) is also recognized by all participants with a mean of 1.93. In the end, most participants agree that IT in person-oriented health care service is more than a cost position (V3) and should be regarded differently. Yet, this

item also comes with a high standard deviation of 1.3, and a more detailed analysis reveals that especially staff and employees rate this the lowest.

In the following the results will be analyzed a bit more in detail, taking into account the segmentation by company size and health care field of service (Tables 4 and 5). Concerning company size, it becomes evident that the positive perception of the role and value of IT grows with company size. An exception form medium sized companies (11-50) who provide the most positive scorings. This might be due to the fact that within this group, our data set contained a rather large number of IT executives, who also generally provided the highest ratings. Our results confirm the prevalent notion that larger companies already have a stronger need to implement IT solutions in order to realize economies of scale, which is directly represented in the value ratings. Very small companies, including self-employed, still get along quite well by only applying little IT. Yet, our results reveal that they already see the need to prepare for fulfilling legal requirements.

	1-10		11-50		51-250		>250		Total	
	Mean	STD	Mean	STD	Mean	STD	Mean	STD	Mean	STD
V1	2.13	1.14	1.64	0.73	1.96	0.97	1.91	0.75	1.92	0.93
V2	2.33	1.18	1.64	0.73	2.30	0.91	2.27	1.32	2.18	1.06
V3	3.27	1.39	2.46	1.14	3.28	1.17	3.91	1.23	3.23	1.30
V4	1.84	1.04	1.71	0.86	1.65	0.86	1.55	0.86	1.69	0.90
V5	2.80	0.96	2.00	0.98	2.35	0.97	2.18	1.47	2.36	1.10
V6	2.06	1.12	1.71	0.69	1.91	0.78	2.00	1.02	1.93	0.90
Mean (max=5), STD = standard deviation										

Table 4: Descriptive analysis of overall role and value of IT, segmented by company size (Source: Sample data)

Regarding the health care field of service in which the participants are engaging, it can be seen that especially acute care providers rate the value of IT lower than the rest. This might be due to the fact that within these services, planning, scheduling or information logistics, which usually bear the greatest potentials for implementation of IT, is of less attention to the service providers. Another point could be that economic cost pressure, as already visible and existent in other health care sectors, is not yet of utmost importance within this field. Low ratings can also be found by home care service providers. This confirms the prevalent notion that especially in the care sector, there are retentions against usage of IT. Additionally, as care services are very people bounded and emotionally challenging, there is the opinion that these services are not suitable for implementation of IT (Menschner, Hartmann, Leimeister 2010; OECD 2005; Böhle, Glaser 2006). Additionally, employees fear to be replaced by technology, which would have a negative impact on service quality.

	Prevention		Acute care		Rehabilitation		Home Care		Others		Total	
	Mean	STD	Mean	STD	Mean	STD	Mean	STD	Mean	STD	Mean	STD

V1	2.00	1.31	2.29	0.69	1.66	0.87	2.06	0.92	1.71	0.77	1.92	0.93
V2	1.95	0.92	2.00	1.50	2.28	1.22	2.26	0.79	2.29	0.85	2.18	1.06
V3	2.58	1.56	4.12	1.11	3.13	1.48	3.44	0.95	3.06	0.66	3.23	1.30
V4	1.63	1.17	1.59	0.80	1.66	0.90	1.74	0.93	1.83	0.51	1.69	0.90
V5	2.26	1.05	2.41	1.50	2.37	1.13	2.26	0.99	2.61	0.92	2.36	1.10
V6	2.09	1.28	2.06	1.03	1.78	0.61	1.97	0.97	1.78	0.43	1.93	0.90
Mean (max=5), STD = standard deviation												

Table 5: Descriptive analysis of overall role and value of IT, segmented by health care field of services (Source: Sample data)

3.3. Barriers and challenges for IT usage and implementation

After having gained a better picture on actual usage and value perception of IT, the next part of our study focuses on barriers and challenges for IT usage and implementation. The usage of IT systems is not always without problems, which also can have affect on the perception of benefit and value of IT systems. Due to this fact, the survey participants had the opportunity to rate different barriers and challenges for successful implementation of IT from their point of view. They could rate the different barriers by use of a 5-step Likert Scale, ranging from 1 („totally disagree“) to 5 („totally agree“). Additionally it was here possible to give no answer, too. The items are displayed in table 6. The findings are intended to provide insights on how IT innovations have to be adapted in order to overcome these barriers. The items are based on an analysis of different studies in literature (Koebler et al. 2009; Berndt et al. 2009), and were extended by the findings from our qualitative pre-studies and interviews.

Question Items for barriers on IT Usage	
B1	We cannot identify an economic benefit.
B2	There is only little budget for IT projects.
B3	We expect enormous costs for planning and restructuring.
B4	Solutions do not cope with our requirements.
B5	Solutions are too cost intensive.
B6	Compatibility issues with existing systems.
B7	No time due to daily business.
B8	Missing IT competences within organization.
B9	Missing support by staff and employees.
B10	No acceptance by customers.
B11	Cannot find cooperation partners.

B12	Risk of failure, especially if vital business processes are concerned.
B13	Quality of existing processes is threatened.
B14	Applications are not user-friendly.

Table 6: Question items for barriers on implementation of IT

The bars in figure 1 show the comparison of the different items. The descriptive analysis of the items reveals that especially the cost-related items (B1, B2, B3 and B5) are of huge concern. More than 38% of the participants agree that there is only little budget for IT projects, and 39% expect enormous costs for planning and restructuring. The fact that solutions are too cost intensive is only disagreed by 16%. In order to be successful, it can be concluded that well-working business models and clarification of economic benefit have to be realized and communicated. This might be due to the fact that the whole health care sector is already undergoing enormous cost pressure and therefore not willing to invest without a clear return on investment.

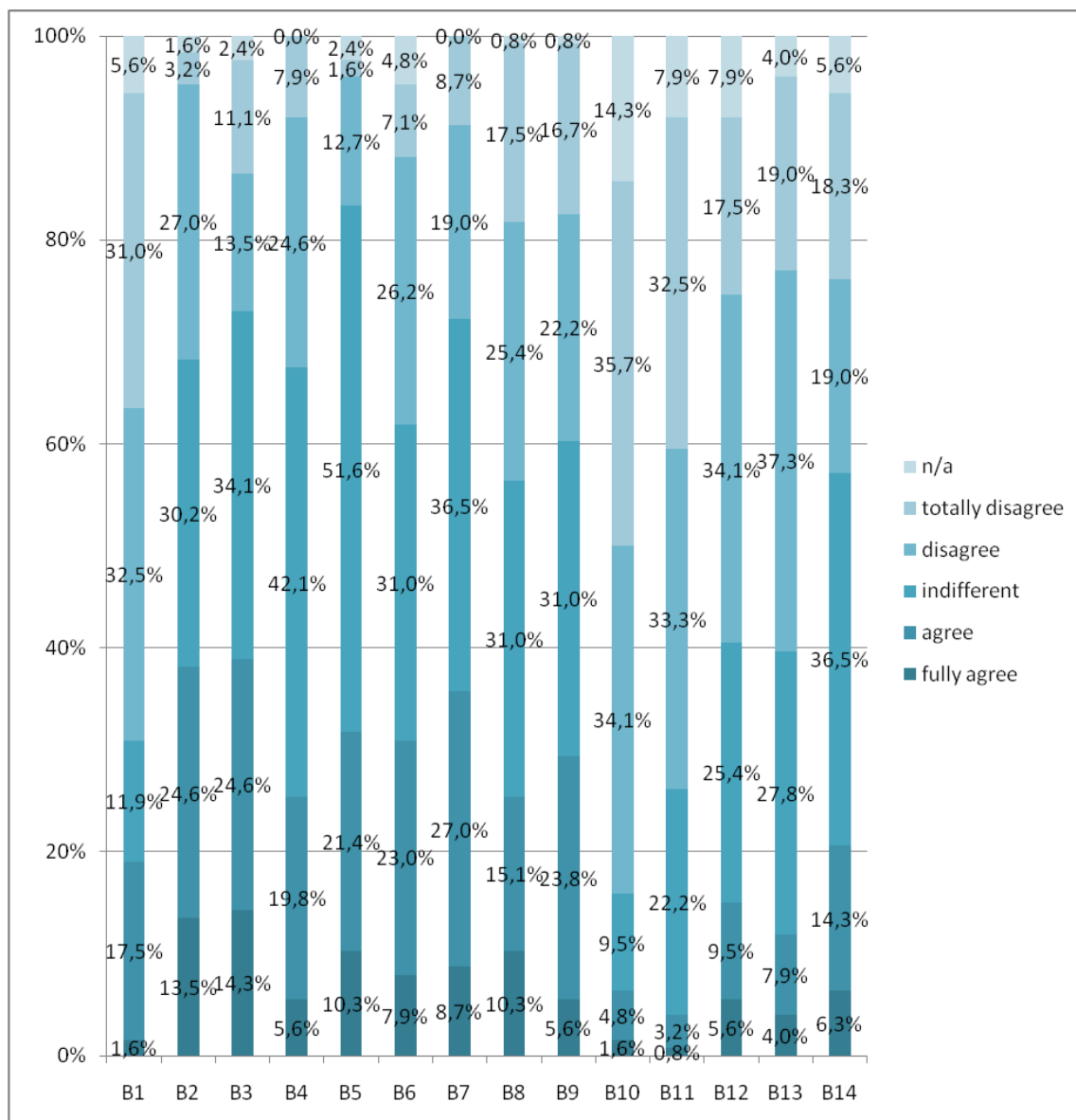


Fig. 1: Distribution of barriers (Source: Sample data)

In contrast, acceptance issues by customers and the availability of suitable cooperation partners are rated significantly lower, which is in contrast to the findings from our qualitative pre-studies. Further barriers like missing support by staff, compatibility with existing systems and usability are also rated high. Yet, only little participants see problems with existing business processes or risks of failure.

3.4. Future use of IT

In the last part of the study we asked the participants on their estimations on future use and implementation of IT and upcoming AAL technologies. The results revealed that the greatest interest is in implementing mobile data capturing techniques (more than 40%). Concerning other technologies, there can generally be seen interest, yet there is skepticism on putting these into practice. Participants rated quality assurance measurements (37%), nutrition management (38%), (semi)automated documentation systems (38%) amongst the most interesting and most probable solution for the future. Barriers for future use of AAL technologies include insufficient awareness level of solutions (27%) interoperability issues (33%), unknown cost-benefit ratios (36%), and cost-intensiveness (40%). Yet, these findings are missing statistical validation, as more than 50% of the participants opted for no answer. This, contrarily, is a strong indication that upcoming AAL technologies are not yet sufficiently known amongst service providers, or, eventually, they do not know enough about their functionalities and benefits in order to be confident enough to provide estimations.

4. Limitations and further research

This study is not without its limitations. First, the study is limited by its data collection process and data set structure. The collected data represents a snap shot of reality and therefore conclusions on dynamics and timely progression cannot be derived. In the future, multiple and frequent data collection processes could lead to interesting findings over time. The data set structure is not representative along sponsorship and size segmentation, also the mean of an online survey leads to a bias. Second, the study only considers the perspective of managers, IT-personnel and staff of German health care providers, which might generate a bias on question items. Further analysis might be coupled with additional qualitative data collection, in order to create a deep and coherent understanding of these preliminary findings. In combination with further in-depth statistical analysis, the researchers plan to generate and test structural equation models to expose cause and affect chains in IT usage of health care providers. The generated findings could be used to discover similarities and differences to industry-related results and patterns discovered in comparable studies.

With this study, we collected a unique and empirically broad state of the art descriptive study on IT usage and acceptance by providers of knowledge intensive person-oriented services in the German health care sector. It helps to provide a clearer picture on actual usage and implementation of IT and new technologies by service providers. Further, we presented insights in motivations, barriers and retentions of service providers in implementing IT. The results of our study can make a contribution to the development of IT-enabled services, as it provides detailed information of the needs and attitudes of service providers. It helps to understand how service provid-

ers are actually implementing IT and new technologies as well as barriers and potentials for upcoming technologies. As to theory, this study might contribute to the research area of service science by offering a deeper understanding of knowledge-intensive person-oriented services and providing insights into the empirical situation of IT acceptance amongst service providers of such services.

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