WILLINGNESS TO PAY FOR REMOTE SERVICES AS AN ELEMENT OF INNOVATION ADOPTION IN BUSINESS-TO-BUSINESS MARKETS

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COMPETITIVE

Purpose of the paper and literature addressed:

Globalization, cost management, and recent developments in telecommunication led to changes in services management concerning machinery and equipment sold by manufacturers all over the world. Teleservices or better "remote services" seem to be one possible solution. Remote services could be an innovative approach to offer customer solutions. Remote services require a substantial and different participation of the user and offer advantages and risks for the machine owner/user. Therefore the question arises whether the service innovation creates value or not. This paper analyzes the customer's willingness to pay for remote services in a b2b setting. Attributes of remote services that are key to creating and destroying value are identified and evaluated. Publications of service management and industrial marketing management are addressed.

Research method:

The paper is predominantly based on a multinationally conducted conjoint analysis which explores the customer's perception and evaluation of different service processes in order to establish an appropriate range of remote services. On the basis of a conjoint analysis willingness to pay as well as perceived risks and barriers to adoption are investigated for different segments of adopters. The participants of the study are 203 customers of a German machinery and industrial equipment manufacturer.

Research findings:

Compared to on-site services the virtual participation of customer resources through remote services is expected to result in a substantial increase in efficiency and effectiveness from both the service provider's and customer's perspective due to faster and more individualized problem solutions. From a customer's point of view these benefits are evaluated differently among the identified segments of adopters in relation to the involved costs for reducing the risks associated with implementing communication technology.

Main contribution:

The transition from a traditional machinery and industrial equipment manufacturer to a service provider involves unique challenges. Many businesses offer a wide but unprofitable

range of services. Remote services could be an appropriate means to co-create added value, reduce service costs on both sides and at the same time increase willingness to pay. Therefore, service providers should implement instruments in their marketing strategy which provide a transparent service process and signalize trustworthiness in order to reduce perceived risk on the customer's side

Keywords: service management, remote services, customer participation, willingness to pay

Introduction

In business-to-business (b2b) marketing, for example in the machinery and equipment-manufacturing industry, close buyer-supplier interaction and satisfying individual customers' needs is a long-term researched phenomenon (Håkansson, 1982; Ballantyne and Varey, 2006). Marketing scholars have discussed closely related value creation in different disciplines as a customer-driven, jointly developed solution process (Anderson and Wynstra, 2010; Payne *et al.*, 2008). It is therefore not astonishing, that value co-creation plays a major role in different marketing approaches such as the lead user concept (von Hippel, 1986), client co-production (Bettencourt *et al.*, 2005), value co-production (Ramirez, 1999; Wikström, 1996), customer participation (Chan, Yim and Lam, 2010) or customer integration (Gouthier and Schmid, 2003; Kleinaltenkamp and Jacob, 2002; Frauendorf *et al.*, 2007).

Almost parallel to the theoretical debate, significant changes to machine and equipment-manufacturing in the marketplace have caused a service revolution. Due to the increasing intensity of competition and the dynamic complexity of customer needs, the industry has strengthened its delivery of comprehensive services, and integrated them with core products to solution-based offerings in order to secure long term-growth (Sawhney, 2006; Jacob and Ulaga, 2008). For a supplier company, after-sales services such as repair, maintenance, training or energy consultancy and recovery offer significantly higher margins compared to the decreasing product margins. This is valid and evident throughout the entire lifecycle of the service initiating core product (Cohen, Agrawal and Cohen, M., Agrawal 2006). The corresponding expansion of the service-intensive solution portfolio reflects the theoretically driven shift from a good- to a solution- (Lindberg and Nordin, 2008) or even service-centered logic (Gummesson. Lusch and Vargo, 2010). Therefore after-sales services are not just add-ons to tangible goods, but can dominantly drive economic success (see e.g. Vargo, Lusch and Akaka, 2010).

The purpose of this contribution is to analyze the customer's willingness to pay for remote services during the after-sales phase in a b2b setting. The attributes of remote services are key factors to co-creating value for manufacturing firms, once different participation levels have been identified and evaluated.

Firstly, we define remote services as a special type of post-sold services in the machine and equipment-manufacturing process, and conceptualize their value on both sides of the market. Secondly, we transfer discussed advantages into service attributes, taking into account the intensity of participation in value co-creation. Thirdly, we conduct a conjoint analysis complemented by a questionnaire to gain insights into how customers evaluate different remote services. Finally, the results of the empirical study are discussed and implications are given.

Conceptual Development

No matter how brilliantly machines or equipment are developed and designed, they are subject to deterioration over time, since they operate under certain environmental conditions or stress. This process is difficult to predict, and can cause machine failure or even the shutdown of the entire production process. In any case this leads to problems of supplying customers and to enormous cost increases. It is for this reason that regular maintenance enhances the level of availability and reliability during the lifecycle of physical assets like capital goods and equipment (Jardine, Lin and Banjevic, 2006).

Recent developments in information, communication, and network technology have changed the nature of how services, particular in maintenance are conceived, developed, and delivered (Meuter et al., 2005; Bitner and Zeithaml, 2010). This dynamic process has paved the way for technology-mediated, high interactive services (Bolton and Saxena-Iyer, 2009), which can be jointly designed and delivered everywhere and anytime. In the case of machinery, equipment or other high technology manufacturing industries, this innovation creates opportunities for different kind of unique remote services. Examples for this are remote surgery (Marescaux, 2001), remote maintenance and repair services (Prahalad and Ramaswamy, 2004a) or the already established remotely delivered IT-Consulting.

Although companies are increasingly providing remote services, surprisingly little research has been carried out in marketing and service management that addresses the overall potential and market acceptance of these innovative services (Biehl, Prater and McIntyre, 2004). Wünderlich's research is one of the few exceptions. She has undertaken fundamental research about the newly emerging subtype of complex remote services. She defines remote services as follows: "Interactive Remote Services are services that a provided via technology-mediation to connect 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" (Wünderlich, 2009, p. 24).

Besides the interactive participation within the co-production process, services in general and consequently remote services in particular are characterized by a high degree of intangibility concerning the output (Levitt, 1981). At first the consequential as well as consequences resulting from further service specific characteristics shall be discussed from a theoretical as well as from a conceptual perspective for deductively identifying beneficial attributes of remote services and for being able to reduce or eliminate service specific follow-on consequences later on.

Immateriality and a coherent lack of physical observableness impair the evaluation of a service and its quality attributes as well as they limit the potential for a comparison of a service to alternative offers before an acquisition. This deficit results in perceived uncertainty on the customer side (McDougall and Snetsinger, 1990). From a customer perspective participation is linked to customer specific costs and benefits which presumably have a direct impact on the willingness to pay. The customer's perception concerning integration thereby may turn out very differently for each individual customer (Bowen, 1990).

The so called costs for integration of a customer are, in comparison to other service specific costs for a provider, rarely discussed in literature (Berry and Yadav, 1996; Etgar 2008). From the customer' perspective costs of integration in the b2b setting represent predominantly monetarily quantifiable amounts which should be integrated in professionally conducted purchasing decisions. For instance time effort for integration in a b2b setting is such a

quantifiable amount. Furthermore, co-production may result in a customer's perception of uncertainty with regard to the provider's ability and willingness to deliver results.

Therefore generally the uncertainty resulting from integrativity and immateriality leads to a higher perceived uncertainty in the run-up to an acquisition compared to traditional physical assets (Mitchell and Greatorex, 1993). Hence within the management of interactive co-production processes a great significance is placed on the identification and the reduction of uncertainty. In this context signaling plays an important role (Spence, 1976).

For a customer being willing to acquire remote services and collaborate within the respective co-production, integration needs to be associated not only to costs but also to a perceived net benefit which mainly can be explained by advantages in respect to quality, time and control issues (Kelley, Skinner and Donnelly, 1990).

In order to conceptionalize and operationalize these advantages in terms of service attributes, a closer look at the process of a typical remote service is necessary. Taking the introduced definition of remote services into consideration, the fundamental system of machine- and equipment-related remote repair and maintenance, consists of the following process steps as can be illustrated in figure 1. First of all, remote services require software and hardware-related data from sensors, webcams and monitoring programs. In the case of machine failure, data of the machines condition is sent through a broadband-based information and communication system to the service technicians. The customer has the authority and ability to allow the data of the service object to be transmitted to the remote service provider. In addition to this the customer can also decide whether the data should be sent continuously, periodically, or only on demand. Once instruments have collected and transmitted sufficient data to a service centre, the service technician can analyze and monitor variances to determine the need for maintenance. If applicable he/she can then remotely re-configure the service object (Jonsson, Westergren and Holmström, 2008).

As problem identification and solutions vary in their degree of complexity, remote services differ in their level of automation and consequently in the intensity of customer co-production. From basic software updates to the repair of highly customized products, it is always easy to obtain the best result with an automated machine-to-machine interaction. Characteristic of knowledge-intensive business services (Bettencourt et al., 2005) is the need for the customer to perform intensive, virtual human-to-human interaction and collaboration with the service technician diagnostic or even mechanical task for enhancing the co-creation of value (Wünderlich, 2009).

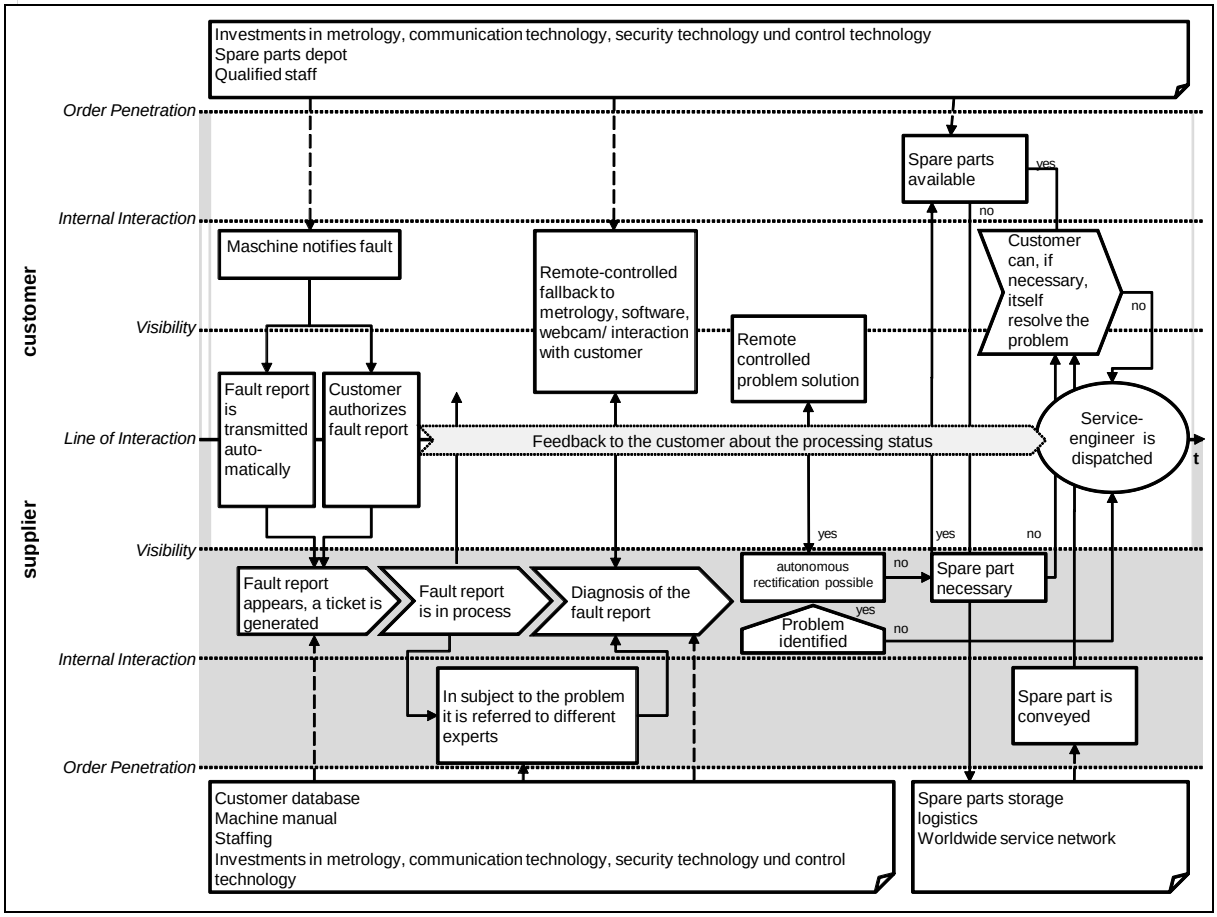

Figure 1: Stereotypical blueprint of remote service in the machinery and equipment manufacturing industry

Comparatively little is known about how customers in general and under consideration of different participation levels evaluate the co-creation in interactive remote service. If customers and providers gain advantages, remote services can be a fruitful source of co-creating value (Jonsson *et al.*, 2008). Regardless of the physical buyer-provider distance, both sides of the market can benefit from time and cost reductions, compared to on-site maintenance and repair. From a customer point of view, remote services can increase the availability, flexibility, and productivity of problem diagnosis and problem solution. Due to principal-agent problems, remote services involve their own unique challenges (Wünderlich, 2009). For example, the need to address customer's data security concerns. In order to overcome this problem, providers of remote services have to find ways to create trust, for example by demonstrating to customers that they can intervene in the service process. In order to gain a first impression in how customers evaluated interactive remote services in b2b marketing, we conducted a transnational conjoint analysis together with a producer of compounding and extrusion technology equipment.

features	characteristic A	Characteristic B	characteristic C	characteristic D
1. Handled products	are analyzed	are not analyzed		
2. Feed	is analyzed	is not analyzed		
3. Drive sections	are analyzed	are not analyzed		
4. Process sections	are analyzed	are not analyzed		
5. Discharge units	are analyzed	are not analyzed		
6. Webcam	available	not available		
7. Security of data	certified	not certified		
8. Access to machine data	unlimited	time-limited	customer has to authorize all access to machine data	
9. Response time after failure report	max. 15 min	max. 30 min	max. 1 h	max. 3 h
10. Data analysis	available online in real time	is sent within 6 h		
11. Processing status	available online	not available online		
12. Monthly fee per machine	250 €	450 €	650 €	850 €

Table 1: Attributes and levels included in the conjoint analysis

In the next step we used a traditional conjoint analysis, based on the common part-worth function in order to evaluate respondents' judgments (Green, Krieger and Wind, 2001). Due to the limited number of attributes in the traditional conjoint analysis (Green and Srinivasan, 1990), we constructed partial profiles with an attribute number of six, constituting the stimuli set. Respondents evaluated profiles through a pairwise comparison on a nine-point Likert scale. We reduced the task of evaluating the number of stimuli by using a modified Fedorov algorithm to generate a D-optimal design (Cook and Nachtsheim, 1980). This reduced the

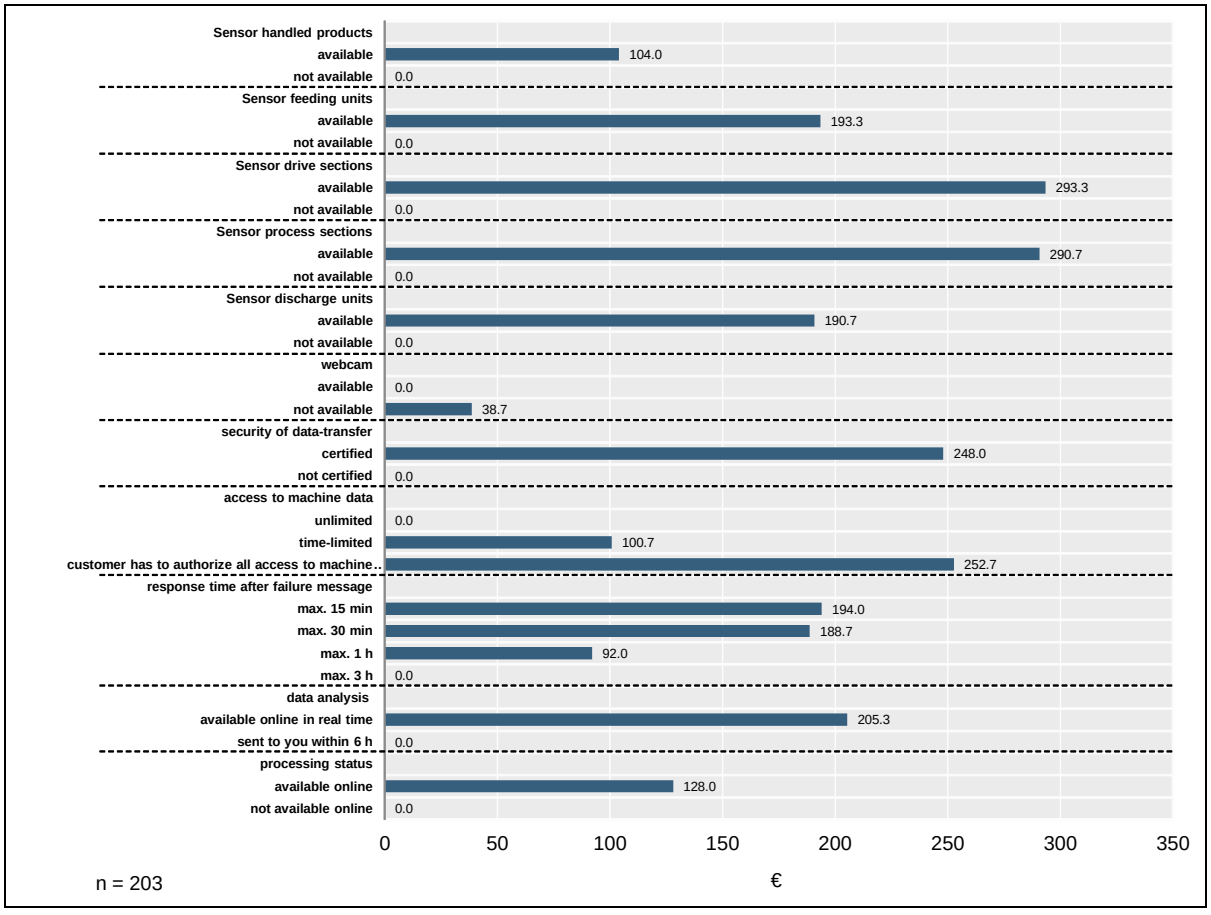

Figure 2: Part-worth and willingness to pay

For further improving the internal validity of $R^2 = 0.4$ a more differentiated examination of the subjects was carried out. This examination aimed at ensuring a target group specific alignment of the range of services offered and a herewith connected levy of the willingness to pay. The identification of respondents with largely homogeneous preferences can accordingly show a positive impact on the internal validity of survey results. A traditional approach used for segmentation is the examination of individual national and foreign markets or regions. As

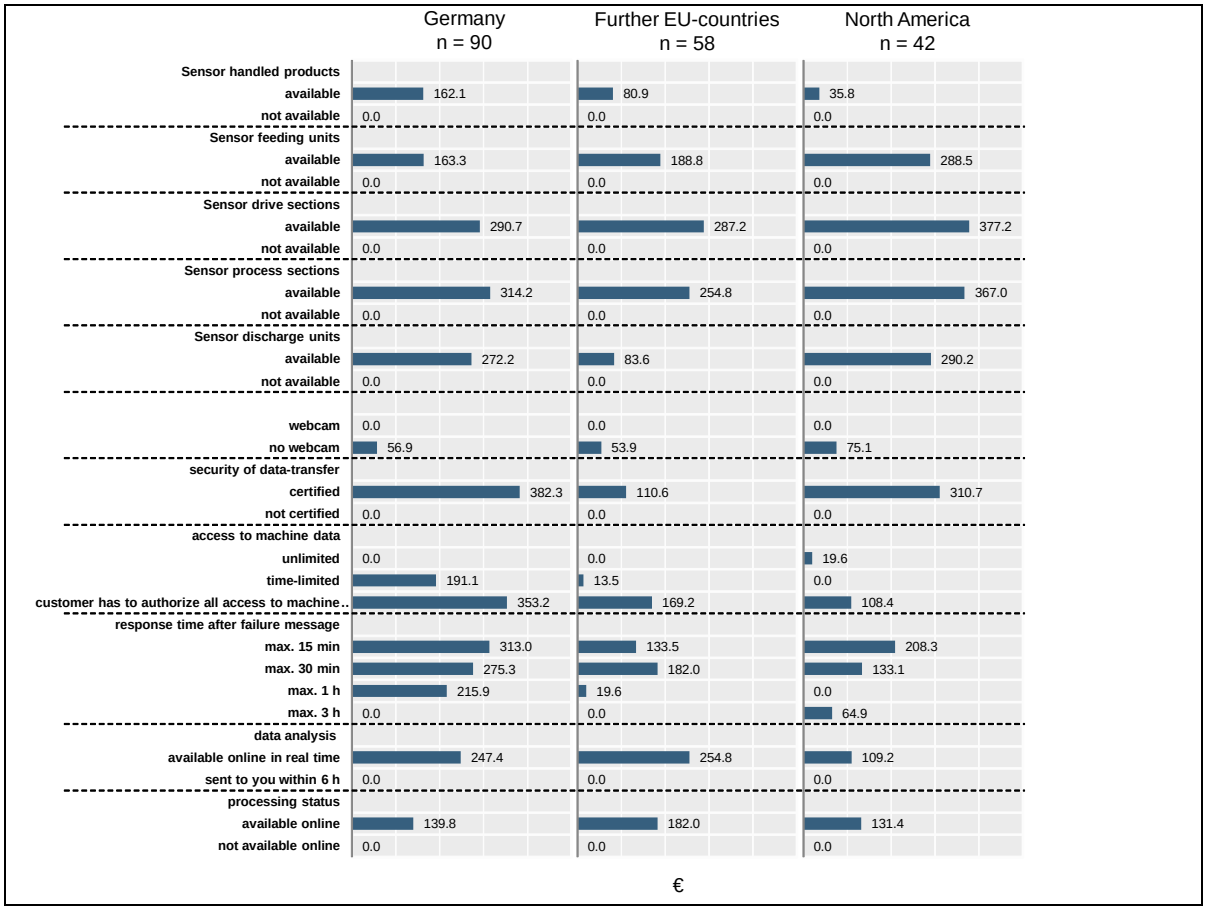

Figure 3: Willingness to pay in selected regions

Compared to Europe, sensor information is associated with a higher willingness to pay in North America, except for handled products. Within all the three segments a considerable rejection towards the use of a webcam during the service process can be observed.

Especially in Germany a high additional willingness to pay for data transfer certified by an independent third party institution appears to be existent with values of $R^2 = 0.43$. This also applies for the manual authorization of information as a further safety relevant aspect of the integration of information in the building process of remote services. The North American market is the only segment in which an additional, though low, willingness to pay for unlimited data transfer exists.

Examining response time, contradicting results were found. In Germany willingness to pay increases almost in line with a reduction of response time and is located well above values for all respondents. At a closer look, if the differences of partial benefit values are compared to the differences of maximum response time, subjects perceive a reduction of supplier's response time from a maximum of 30 to a maximum of 15 minutes as a further more than linear increase in value. The amount of the difference between the attribute values with the lowest and the highest value might perhaps be traced back to the possibility that these respondents associate a higher level of Total Cost of Ownership (TCO) with a machine failure. Comparing the attribute values of response time between the segments and all

respondents it becomes clear quite rapidly which kind of misinterpretation can result from highly aggregated data and averaging. In Germany, given an adequate alignment of output potential combined with a reduction of response time an additional willingness to pay of 37.73 € can be generated. However, for all respondents a value of merely 5.30 € can be observed, as depicted in figure 2. In the rest of Europe and the North American market an analysis of the attribute values concerning "response time" results in a contradicting picture. The partially higher willingness to pay suggests heterogeneous preferences within these two segments. Therefore it is not surprising that the internal validity for the segment "further EU-countries" of $R^2 = 0.397$ and of $R^2 = 0.386$ for North America is located below values across all respondents.

Moreover the respondents can be distinguished in terms of their participation in different phases of the procurement process. Therefore, as displayed in figure 4, the following phases were examined in regard to their internal validity:

1. Initiation of demand ($R^2 = 0.436$)
2. Budget approval ($R^2 = 0.449$)
3. Evaluation of offers ($R^2 = 0.434$)
4. Offer negotiation ($R^2 = 0.438$)
5. Decision ($R^2 = 0.449$)
6. Procurement of after-sales services ($R^2 = 0.440$)

Phases 1 to 5 relate to the investment decision about equipment and machinery. Phase 6 exclusively accounts for the procurement of after-sales services. The phase-specific examination of the procurement process as a start leads to an improvement of goodness of fit compared to previous analyses.

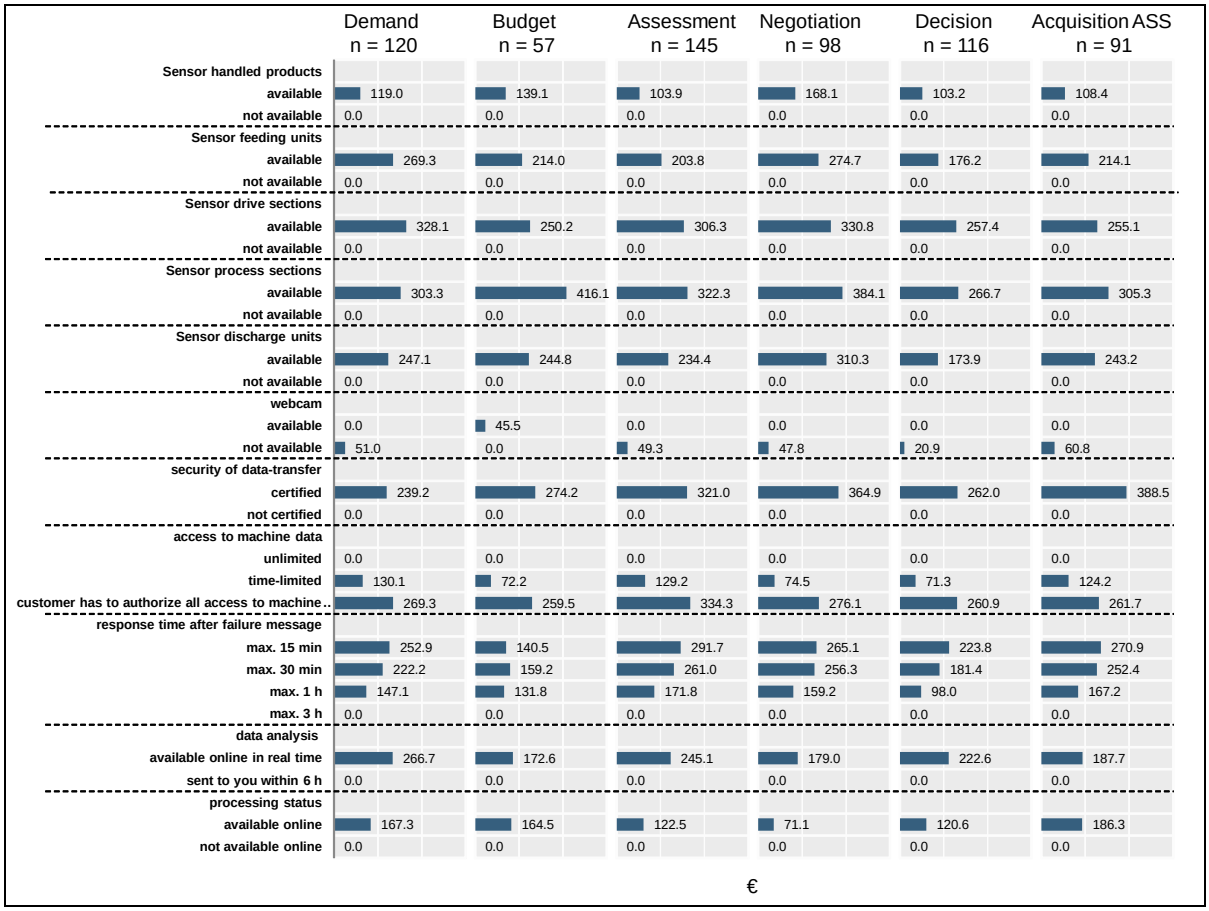

Figure 4: Willingness to pay as a function of participation within the individual phases of the procurement process

The finding that for the majority of preferred attribute values willingness to pay is lowest for deciders is not surprising. Yet, it is surprising that subjects who participated in negotiations show the highest level of additional willingness to pay for all sensor information questioned.

In contrast to respondents as a whole, subjects that were involved in the procurement of after-sales services associate a higher willingness to pay with the majority of preferred attributes. Particularly noticeable, also in comparison to other procurement phases, is the very high evaluation of the attribute values “webcam not available”, “certified data transfer” and “processing status online accessible”. It must be presumed that these respondents are aware of the risk associated with data transfer due to their specific expertise. Moreover it can be assumed that they perceive no additional value related to the integration of a webcam and that they depend on an ongoing processing status for the estimation of prospective re-continued machine availability.

Concluding, the risk perception related to remote services and its possible impact on additional willingness to pay will be analyzed. For this purpose a subdivision into risk associated to procurement and risk associated to use of after-sales services is undertaken. Due to the small size of individual groups, procurement risk is not evaluated separately. However the parameter values of perceived use related risk provide some important insights.

As depicted in figure 5, 28.1 % of the respondents perceived a risk, 29.6 % associate some partial risk and 22.2 % of subjects associate no risk to the use of remote services.

For subjects who perceive a high level of risk, the retrieval of sensor information is associated with the lowest willingness to pay, except for discharge units. Attribute values which can reduce the perceived risk like certified security of data transfer, manual authorization of data and processing status online, are characterized by a very high additional willingness to pay.

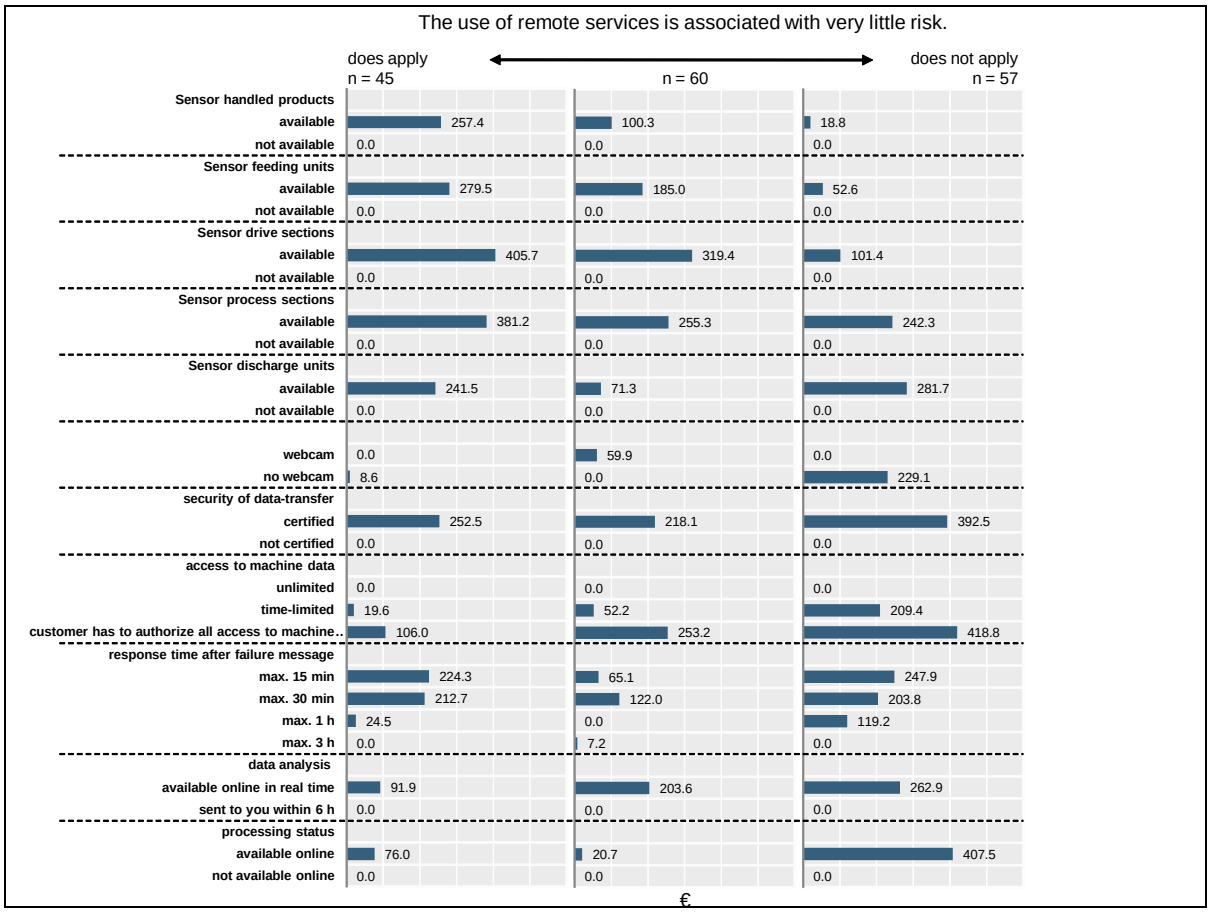

Figure 5: Willingness to pay as a function of risk perception associated to the use of remote services

Altogether in comparison to other groups it can be noted for this target group, that a high level of risk perception does not generally result in a lower willingness to pay. This however applies to the actual advantages of remote services, namely faster transmission of information about the state of individual machine components and of handled products. Yet willingness to pay is very high for characteristics that may help to reduce uncertainty. Internal validity for this group adopts a value of $R^2 = 0.475$.

For respondents who associate only low risk with the use of remote services, certified data transfer is equally important. However they attach particular importance to the retrieval of information. Regarding the access to machine data this target group displays the same preference order as respondents who perceive a high level of risk. Nevertheless single values for willingness to pay turn out significantly lower. Examining response time, the difference between willingness to pay associated to a maximum response time of either 15 or 30

minutes is low, yet a huge difference can be observed compared to a response time of more than one hour. The goodness of projection equals to $R^2 = 0.467$.

Subjects for which the use of remote services evokes a partial risk, show a high additional willingness to pay for a webcam. In comparison to the other two considered segments the further preferred attributes are connected with a medium or low willingness to pay. The internal validity within these segments is located at $R^2 = 0.472$.

Discussion

Examining the identified target groups it needs to be noted that significant differences for single attribute values can be identified between the individual groups in relation to partial attribute values respectively willingness to pay. The insights gained make a significant contribution to a target group-specific market launch of remote services and hence for market segmentation. The results serve as a target group specific alignment of product and pricing policy including a product and price differentiation.

If at first the willingness to pay for individual attributes is looked upon, some very interesting results can be derived. Within the attribute “Access to machine data” the highest willingness to pay can be observed for manual authorization of data. It shows the highest values in the segments “Germany” and “High risk associated with the use of remote services”. According to the present study the continuous integration of information in the service delivery process respectively a condition monitoring does not generate additional willingness to pay for the majority of respondents. The subjects clearly refuse the unlimited transfer of entitlements to disposal for an automated integration of information. They much more prefer a type of integration which allows them to control the date for data release respectively integration on their own from case to case.

The integration of a webcam in the service delivery process shows a similar picture. It was denoted with the determination of the relative significance of attributes of a webcam that attribute values related to the use of a webcam were associated with a low willingness to pay. The overwhelming number of respondents does not perceive additional value in relationship to an integration of webcam based information and clearly rejects the installation of a webcam.

Data transfer certified by an independent third party appears to be a very important signal for the reduction of perceived uncertainty. All target groups show an articulate preference for this expression of the attribute „data transfer“. Especially the involvement of a buying center in the procurement of after-sales services and high risk levels associated to the use of remote services exhibit a high willingness to pay for a certification. As well the transparent display of the service delivery process in the mode of an online accessible process status is preferred by subjects.

Examining response time upon entry of a failure report a very diverse building up of preferences can be observed. For some target groups the willingness to pay concerning the attribute value “response time” is higher for response time within max. 30 minutes than for responses within max. 15 minutes. As explained before, both attribute values still offer an enormous time advantage compared to sending a service technician. The preference of a response time of maximum 30 minutes compared to an even shorter response time of max. 15 minutes might probably be ascribed to respondents assessing a response time of 15 minutes as unrealistic. However it cannot be derived from this, that a supplier should not offer the fastest mode of response time within its service range.

Data analysis accessible in real-time was preferred by all target groups, yet to a different extent. Once again the highest willingness to pay could be identified for customers with a high risk perception. But also in the examined group „Maintenance partly self-contained/remote services“ a useful complement for internal servicing activities and a high willingness to pay was determined.

The integration of sensor information evokes willingness to pay within all target groups. The overwhelming number of target groups exhibits the highest additional willingness to pay for the integration of information about the processing status of drive and process sections, the actual core of the compounding and extrusion process. Within the sensor information almost all target groups display the lowest level of additional willingness to pay for information about the status of handled products. Probably this can be ascribed to quality control activities during earlier phases, as for instance delivery. Furthermore, the examined sample shows that some advantages of remote services such as for instance response time and flexibility disconfirm the disadvantages of a maintenance conducted personally by the supplier at the customer's site. These findings can be used within the service strategy for deepening the relationships with existing customers in the area of maintenance and successfully driving the successful acquisition of new customers.

Finally the goodness of results of the preference measurement is evaluated. Examining face-validity except for the attribute response time following a failure report no peculiarities were identified. The preference of certain attributes such as "webcam availability" and "access to machine data" was identified previous to the empirical research by means of theoretical findings and an explorative pre-study. A deviation from actual results could however not be explained.

The conjoint analysis' internal validity of $R^2 = 0.4$ for all respondents can be regarded as rather good for a product not yet introduced to the market in this specific composition. This result could probably be obtained because a great significance was placed on the identification of service characteristics and its attributes at a conceptional level, but in particular within a comprehensive explorative pre-study. Furthermore with the help of the customer database used, a targeted selection of subjects was forced for guaranteeing the professional competence within the evaluation setting. By means of the additionally surveyed and evaluated data the internal validity in the course of the target specific examination could be raised again considerably.

Research implications

The study demonstrates that customers have a strong preference for condition-based data of specific machine parts, which are integrated and analyzed during the remote service process. The perceived benefits of the service attributes are influenced by security concerns. Due to information asymmetries between the service provider and the buyer from a customer's point of view, remote services are credence goods. If the perceived risk can be reduced through screening and signaling, the acceptance of remote services will increase. This would allow the real benefits of remote services to dominate customer preferences. Strong preferences for on-demand initiated data transmission indicate that most customers are not ready for a fully automated condition monitoring system. For this customer segment remote service acts more as an insurance for when they cannot handle the failure on their own rather than a sustainable problem solution.

The findings of this study might serve for improving the quality of future studies. General starting points within the chosen survey method are to be located within the attainment of a more consistent response pattern and the selection of different parameter estimation. The empirical research is based on an additive, compensatory preference model, which compared to other estimation procedures stands out due to its flexibility and comprehensive contingencies for application. Therefore chances for a further improvement of internal validity can mostly be located within the area of voiced preferences. In the following some approaches which might impact positively on internal validity and therefore should be considered for continuative studies shall be discussed.

Even though research and practice have been dealing with remote services for some years, the familiarity of subjects with the use of remote services is not as pronounced as implied by corresponding studies. The ongoing diffusion of remote services and a therefrom developing experience with this kind of service will contribute to the possibility to induce a more stringent response pattern for future studies.

The aim of this study was to gain broad insights into customer preferences in order to enable a more customer-oriented design of remote services and along with that a consequential possibility to skim willingness to pay. For the purpose of a more differentiated market development corresponding target groups were considered. Therefore as well the study was conducted in different countries for better capturing country and region specific preferences. Because of the considered niche markets and the heterogeneity of goods and services offered the empirical investigation is limited on customers of one single supplier only. Future studies should concentrate on remote services which are offered by several different suppliers and address a broader clientele. This approach guarantees a greater number of subjects per segment and probably shows a positive impact on the goodness of the survey, as for instance it becomes evident examining customers from Germany within this study.

Summing up it can be noted that willingness to pay for remote services which was possibly examined empirically in an academic research for the first time, delivered some interesting research findings within the research field of customer integration. The preferences concerning service attributes which were identified by means of the conjoint analysis serve for a customer-oriented alignment of future offerings. The real buying behavior respectively the external validity could not be tested because the examined remote services had not been introduced to the market at the time when the survey was conducted. A comparison between the preferences determined in this study and actually observable behavior under real conditions offers a fascinating starting point for further research projects.

Managerial implications

From a technological perspective, high-speed broadband, mobile applications, decreasing costs in telecommunication and sensors, innovative network technology are all important milestones in providing a feasible remote service. If service objects are remote-controlled, the provider gets a deep insight into the customer’s production process. Building on the findings from the sample, practicing managers have to deal with the perceived risks on customer’s side. Customers are concerned about unauthorized third parties possibly obtaining access to confidential data. Remote service providers aiming at success in the market, have to create and demonstrate trustworthiness and reliance not only through technology-based security systems. Due to the lack of face-to-face contact, an appropriate design of the virtual service encounter and relationship specific characteristics are important ways remote service providers can focus on to increase the use of remote services. This strategic orientation would

reduce perceived risks and also enhance customers' willingness to pay. Remote service providers should also clearly communicate with customers and offer training to ensure successful participation in technological-mediated co-production and co-creation of value.

Limitation and future research

The primary objective of our paper was to identify attributes that are crucial to co-create value. Due to the heterogeneity of different industries, the study is limited to the machinery and equipment-manufacturing sector. Remote services are characterized through machine-specific attributes and attribute levels such as selected sensor data. For security and control related attributes, the findings can be generalized. It is important, that further studies are undertaken using a larger number of participants in order to increase the sample size of selected segments. In relation to this, future research could examine the effectiveness of different risk-reducing instruments. A study could be undertaken, which not only takes single machines into consideration, but evaluates preferences for remote services, which monitors the entire production process.

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