Customer Preferences for Service Process Automation and Implications for Optimal Service Design – A Case Study from the Unified Communications Market in Germany

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Abstract. Never before has IT been so crucial to the success of a service business like in today's highly competitive environment. Given the huge advancements of information technologies, automation in service processes has become a key design element. At the same time, designers of services must consider the impact of automation on the customer who is typically involved into the service delivery process. In this paper, we analyze customer preference for automation of service processes based on a conjoint experiment in the Unified Communications industry and derive managerial implications for optimal service design. The results show that including higher levels of automation into the design of Unified Communications services is promising both from a customer and a cost perspective.

Keywords: Service Automation, Service Process Design, Conjoint Analysis, Unified Service Communications Market

1 Introduction

Advances in communications and information technology have a profound impact on how service providers interact with their customers during the service delivery process. Today, automation is ubiquitous, not only in the business environment but also in private life. Automation aims at consigning activities within a process to artificial systems. The introduction of technology often replaces face-to-face encounters and proliferates self-service by involving the customer to perform parts of the service process unassisted.

Examples of automation in the B2C business include bank ATMs, online reservations, online brokerage, hotel self-checkout, etc. In the B2B business, examples include services like automated purchase platforms and automated communication, especially in the IT industry. Automation in IT services is a fairly new field and has

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only recently been introduced – made possible by the ever increasing computing power available and global IP networks.

For service providers, the main argument for automation is usually the increase in productivity and the reduction of labor cost (see e.g. [2]). For example, IBM realized cost savings of $2 billion by redirecting 99 million service requests from a call center channel to an automated online service provision ([3] cited in [9]). However, the cost savings for the service provider can be offset if customers do not accept the self-service technology. McKinsey & Company reports of a firm that re-channeled its billing and service calls to the Web expecting to save $40 million. It turned out, however, that customers did not accept the new technology as expected and the firm simultaneously lost $16 million [9].

The response of consumers to service automation can be mixed. Customers may feel uncomfortable with self-service for various reasons or they may value the increased opportunity for customization, convenience and control [6]. Thus, in face of these potentially conflicting effects, a profound understanding of consumer acceptance of automation is indispensable for designing the right level of automation into a service.

In this paper, we analyze customer preferences for automation of service processes in the Unified Communications (UC) industry and derive managerial implications for optimal service design. UC services provide a technological architecture that aims at efficiently integrating today's manifold communication tools, such as voice, email, fax, video conferencing, instant messaging, data services, e-commerce transactions, etc. The idea is that businesses (as well as of course individuals) can manage all their communications through a single interface. In the UC business, where prices are decreasing and wages are increasing similar to other services industries, automation is one of the main solutions to tackle the challenge of complexity versus commodity. Different levels of automation for UC services are for example remote services/e-services, services on site, or machine-to-machine services. At the same time, customer preferences for automation are poorly understood.

Our analysis of consumer preferences for automation of service processes is done based on a conjoint experiment (further explained below) and a subsequent choice simulation. Our contribution is twofold: first, our study and its results provide a case example (of a particular service in the UC industry offered by a particular company to business clients in a particular region) that demonstrates a high potential of automation in different phases of the service process. Second, we want to demonstrate that conjoint analysis – commonly used in marketing for product design – is a useful tool in IT for service process design, too.

The paper is structured as followed. Section 2 briefly discusses relevant related work. In Section 3, the conjoint study that we carried out in the UC business is described in detail. Based on the utility estimates, managerial implications for optimal service design are derived in Section 4.The last section concludes and discusses future research opportunities.

2 Related Work

Though automation appears to be a key element in service design, systematic research on how customers assess different levels automation and what this implies for service design is not well researched in the literature. Reference [8] discusses research opportunities in service process design and conclude that the question of "How can technology be integrated into the service process in order to improve both efficiency and customization?" is highly relevant but not well understood. Among the few empirical studies is [4], which examines the factors that influence consumer attitudes toward and adoption of self-service technologies in the banking industry. In [9], the key factors are identified that influence consumer willingness to initially try self-service technologies when alternative delivery modes are offered. The authors of [11] examine the cognitive, demographic, and situational determinants of the preference for using self-service technologies over face-to-face encounters using structural equation modeling. They find for example that persons who are high in experiential style as well as older persons prefer personal interactions. Furthermore, waiting times have a significant influence on preference for technology and service complexity moderates the influence of cognitive styles on preference for service technology.

Most of the few empirical studies mainly focus on attitude models to forecast behavioral intentions of consumers in a B2C environment. This paper contributes to narrow the gap by analyzing customer preferences for automation of service processes in a B2B industry based on a conjoint experiment and by deriving managerial implications for optimal service design.

Conjoint analysis is a decompositional statistical approach for estimating the partial benefits (also known as part-worth values) that different levels of a particular service attribute contribute to a consumer's overall evaluation of the service. A service or product is represented as a finite set of attributes whose levels are determinant for the value-to-the-customer, and finally for customer choice, see e.g. [10].

Following [13], we understand value-to-the-customer as a multi-attribute construct, as "the consumer's overall assessment of the utility of a product based on a perception of what is received and what is given" (see also [12]). In the context of IT services, factors that probably impact customer preference for a particular service design are e.g. price, availability, service response times, the level of automation, etc. Accordingly, the preferred level of automation and its perceived partial benefit can only be regarded in relation to subjective, individual and dynamic customer assessment.

Based on the conjoint data, managerial recommendations on the optimal service design can be derived if reasonable assumptions can be made on how preferences translate into consumer choice (probabilities). To support the design decision in a systematic manner, a number of mathematical programming models (for a recent review, see [1]) as well as conjoint choice simulators [7] have been developed in the last three decades. As we will see, these methods are also very useful in our context of service automation.

In particular, our focus is on the process dimension of a service (see e.g. [5] for a discussion of the dimensions of service – potential, process, and outcome) and its design in terms of automation and customer involvement considering the utility that the customer gains from an automated process. We note that an automation of the service process will of course require that automation potential in terms of capacity is built up beforehand. The service outcome should remain the same with or without automation, namely the solution of the customer's problem.

3 Conjoint Analysis of Customer Preferences for UC Service Process Automation

Conjoint analysis has become one of the most widely-used multi-attribute utility measurements technique used in marketing research to measure customer preferences for different features of a product. First, the product must be defined in terms of a set of buyer-relevant attributes and their potential levels, respectively. Then, sets of alternative product configurations, each consisting of a different combination of attribute levels, are generated and presented to respondents in a survey. The respondents are asked to rank the alternative configurations according to their preferences. These overall judgments are used to estimate how consumers make trade-offs at the product attribute level when forming product preferences. In particular, by decomposing the overall preference value into different factors one can statistically estimate the importance of each individual attribute and the partial contribution (part-worth value) of each attribute level.

The decompositional approach has the huge advantage over separately scoring attributes that is has a greater similarity to real choice situations; furthermore, statistical software packages for performing the conjoint analysis, including designing the survey, estimating part-worth values and simulating consumer choices for evaluating different product designs, are widely available. We used SPSS Conjoint 20, a well-established tool available and familiar to us. In the following, we describe the conjoint study in detail along with a discussion of the results.

3.1 Study Setup

Target group. Defining a target group is the primary step when starting with a conjoint analysis. The target group in our case are B2C customers of a UC service provider. 34 respondents were interviewed personally for the conjoint analysis, ideally either representing the majority of customer or customers with the biggest growth potential. To grasp a preferably large number of customers, we concentrate on the customer segments *Key Account* and *Public and Health.*

In this context and in face of the small sample size we want to stress once more that we do not claim that our results are universally valid nor is it the objective of our study to make general recommendations of which level of automation to apply in which situation. Our study and its results should be understood as a case example that demonstrates a high potential of automation in different parts of the service process in a B2C setting. Apart from making a case for automation, we want to demonstrate that conjoint analysis is a useful tool for IT service process design.

Definition of service, attributes and attribute levels. The service we focus on here is a maintenance service for large telecommunications infrastructure. Commonly, UC services comprise maintenance or administration services e.g. install, move, add, change (IMAC) operations in either remote or on site delivery. Spare parts for maintenance work are often also included and some service level agreements (SLA) parameters set. These parameters usually include service, reaction and restore times. Furthermore, price is a relevant attribute as well as the degree of automation (distinguished into service initiation and service delivery). In summary, the service is well described by the following attributes that are assumed to be independent and compensatory:

- Availability
- Response time
- Services included (remote services, onsite services, spare parts)
- **Degree of automation in the service initiation process**
- **Degree of automation in the service delivery process**
- **Price**

To keep the conjoint analysis manageable, we focus on those relevant attributes that we are interested in to optimize, mainly automation, and – to allow financial evaluations of a design – price. Therefore, we assume that the attributes "availability", "response time" and "services included" are fixed a priori to "24 hours/7 days a week", "30 minutes", "all services are included" (as an option, simple IMACs will be also provided by the service provider).

Thus, the last three attributes marked in bold are those of particular interest to us. The attribute levels for the three attributes are given as follows:

Degree of automation in the service initiation process

- No automation (Service will be initiated by calling into a Call Center)
- Simple automation (Service will be initiated by logging onto a dedicated web portal, where the customer gets a overview of the infrastructure, that is cared for by the service provider and can then open an incident or service request)
- High degree of automation (usually, the customer operates an own User Help Desk. Commonly, a user help desk itself has a sort of ticket system to track its own tasks. A high degree of automation makes use of the possibility to deploy a machine-to-machine communication between the ticket system of the customer and the ticket system of the service provider and safe the effort of calling a call center, sending an email or logging onto a web portal)

Degree of automation in the service delivery process

- No automation (Each incident or service request is handled manually)
- Simple automation (IMACs are handled automatically. The customer sent his request in a dedicated format that is than translated automatically and IMACs being implemented by a software tool)

- High degree of automation (Using a web portal, the customer is presented an analytical tree to further limit the incident. By breaking down the incident into smaller steps, the customer eventually is able to find the error himself and initiated an automated resolution. The analytical tree can also be used for service requests)

Price

As prices for UC services have been very fluctuating over the last years, it is hard to determine a market price even for a very specific service. Therefore, we decided to set the price as a percent of software/hardware investment with the following levels:

- 3% of hardware/software investments
- 4% of hardware/software investments
- 5% of hardware/software investments.

Data collection method. We chose a full profile approach mainly due to the fact that we already limited the number of attributes.

Number of stimuli. When it comes to choosing the attribute levels, it is important to define the total number of stimuli. With a symmetrically design we can use the latin square technique to form a reduced that design that makes sure to combine every single attribute level exactly once and thus fulfill a main criterion of a reduced design: to determine a partial quantity that is small enough to be handled but still large enough to represent the full design such that reliable results are ensured.

Final reduced design. The final reduced design that was drawn from all possible combinations of attribute levels based on Latin square technique is given in Table 1 below. In the following interviews, respondents were asked to rank theses 9 hypothetical product profiles.

Table 1. Final reduced design using latin square technique

Card ID	Price as % of investment	Automation in service initiation	Automation in service delivery
1	5%	Automated Interface	Manual handling
2	3%	Web Portal	Self Service/Analytical Tree
3	5%	Call Center	Self Service/Analytical Tree
4	3%	Automated Interface	Automated IMACs
5	4%	Automated Interface	Self Service/Analytical Tree
6	5%	Web Portal	Automated IMACs
7	4%	Web Portal	Manual handling
8	4%	Call Center	Automated IMACs
9	3%	Call Center	Manual handling

Interviews. As stated earlier, we conducted interviews with 34 customers where the 9 product profiles were presented to the respondents. We talked to various customer roles, but tried to get the person with the highest position in the customer hierarchy whenever possible. If the meeting was held with an executive-employee set-up, the executive was asked to rank the product profiles of Table 1 without further consultation with his employee.

3.2 Results

Given the respondent rankings we analyzed the data with SPSS Conjoint 20 to estimate part worth values for different attribute levels. We were quite surprised to see that the attribute with the highest importance for the interviewees was the automation in service initiation. Table 2 shows the estimates part-worth values averaged across the 34 respondents, Table 3 shows the importance of attributes.

Table 2. Average part-worth values estimated from the conjoint analysis, all respondents

Attribute	**Attribute level**	**Average part-worth value**	**Standard deviation**
Price	3%	0.069	0.56
	4%	0.235	0.67
	5%	0.167	0.36
Service initiation	Call center	0.029	2.44
	Web portal	0.000	1.51
	Automated interface	0.029	2.74
Service delivery	Manual handling	0.451	1.13
	Automated IMACs	0.206	0.71
	Self-service/Analytical tree	0.657	0.87
Constant		5.000	

Table 3. Importance of attributes

Attribute	**Importance of attribute (%)**
Price	6.430
Service initiation	64.953
Service delivery	28.617

Taking a look at the detailed data, it becomes evident that service delivery seems to be a part of the service process, where automation is widely accepted given that the attribute level self-service/analytical tree is largely preferred on average. This means that the interviewed individuals are willing to accept a large part of automation, if this accelerates the service process (it can be assumed, that the information, that an analytical tree would enable the customer to resolve 40% of the incidents without any participation of the service provider, is associated with an overall faster incident resolution), even if a larger contribution by the own service staff is required. As the majority of respondents is in fact responsible for IT operations, their focus seems to be on a well-functioning service process, especially in service delivery. In service initiation, the most important attribute with the highest lever to overall preference formation, automation also seems to be accepted among some respondents, while others prefer a call center. Interestingly, with regard to pricing, not the lowest price has the highest partial benefit, although there is tendency towards lower prices, rather than towards higher prices (higher loss of benefit if changing from 4% to 5% than if changing from 4% to 3%).

Among the 34 customer representatives were three individuals in CIO positions (called "management segment" from here on), the rest was in general responsible for IT (Head of IT or similar – "operational segment"). Although we did not include an option to note the position of the respondent, we particularly took a look at those responses. Peculiarly, all three individuals on CIO-level responded with exactly the same pattern. Although not representative due to the very small sample size, it appears that the management segment shows other preferences than the operational positions. Table 4 and 5 below show the results.

Table 4. Average part-worth values estimated from the conjoint analysis,differentiated by position

Attribute	Attribute level	Average part-worth values	
		Management segment (N = 3)	Operational segment (N = 31)
Price	3%	0.000	0.075
	4%	0.000	0.258
	5%	0.000	0.183
Service initiation	Call center	-3.000	0.215
	Web portal	0.000	0.043
	Automated interface	3.000	0.258
Service delivery	Manual handling	-1.000	0.376
	Automated IMACs	0.000	0.226
	Self-service/Analytical tree	1.000	0.602
Constant		5.000	5.000

While the overall importance of attributes varies only slightly, the partial benefits show a different outcome. The management segment clearly favors a high degree of automation, both in service initiation and service delivery. In service delivery, also the operational segment prefers the automated self-service/analytical tree. For service initiation, however, the highest partial benefit is attached to the attribute level call center. This further supports the assumption stated above, that there is a significant difference between operational level and management level regarding attitude towards automation in the different steps of the service process. Interestingly, the operational level seems to emphasize manual handling in service initiation, while accept a high level of automation in service delivery. This might well be, because the customers see a positive trade-off in additional information about the infrastructure (which the customer would certainly get, if they are able to use an analytical tree).

Table 5. Importance of attributes, differentiated by position

Attribute	Importance of attribute (%)	
	Management segment	**Operational segment**
Price	0.000	7.052
Service initiation	75.000	64.519
Service delivery	25.000	28.429

In service initiation, automation does not offer first-hand information benefits for the customer, thus the personal contact towards a call center might be more important. Furthermore, a higher degree of automation often requires a higher customer involvement and thereby causes some cost (e.g. time for submitting requests in certain formats or requiring additional knowledge necessary to benefit from using an analytical tree).

Although price also is a factor, it seems to play only a minor role when deciding about automation. This might be due to the design of the survey, where we tried to keep the influence of the price as low as possible by defining it only via relatively low percentage values but is also evident, as we could not identify any response segment, where pricing was the main focus.

In the following, we will derive implications for optimal service design by taking individual responses rather than aggregate part-worth values into account. By taking the following approach, individual preferences based on different experiences with automation can be taken into account.

4 Implications for Optimal Service Design

The conjoint analysis confirms that automation of service is a valid option for business customers in the UC service business. Service companies should explore this option in more detail when it comes to service design since a higher level of automation can potentially create a win-win situation by providing value to both providers (through expected cost savings) and customers (through higher preference).

Looking at the aggregated conjoint data in Tables 2 and 4, a service configuration highly desirable from the customer perspective should involve high automation in the service delivery process and accordingly provide a large information base for the customer (again, for other determinant design attributes it is assumed that the service is conducted 24/7, response time is within 30 minutes, and all services are included). Both groups of respondents are willing to engage largely in the incident management process, as long as they benefit from additional information and are able to speed up service delivery (both service requests and incident management).

With regard to the service initiation process the design recommendations are not so obvious. In spite of this high affinity towards automation in service delivery, the average respondent in the operational segment is reluctant towards a high degree of automation in service initiation. This might be either due to the fact that

- they do not really see a benefit from this feature (the customer still needs to operate a user help desk),
- they do not gain any additional information and the service process itself is not made faster by significant numbers,
- their performance is made transparent to both the service provider and the own management (The service provider gains insight into the work of the customer as information is exchanged via machine-to-machine communication).

In general, the operational level within an IT organization likes to be in full control over its IT infrastructure and this also includes possible incidents and service requests. As mentioned above, the implementation of an analytical tree means a significant shift of information from the service provider towards the customer. However, an automated interface in the service initiation process, would take away a large part of responsibility from the IT organization of the customer, namely to decide, when to hand over an incident towards the service provider. Consequently, it means a shift of a certain kind of information from the customer's IT department towards the service provider. Whereas the operational segment seems to reject automation in service delivery on average, this appears to be exactly what the management segment requires.

In fact, respondent preferences for automation exhibit a large degree of heterogeneity, not only across the two functional segments but also to some degree within the operational segment. The average part-worth values in Table 2, highly aggregated across individuals, do not reveal the underlying heterogeneity in customer preferences – but in fact, the standard deviation of the data in our sample is very large Accordingly, the predictive power of the aggregated data is naturally limited in face of heterogeneity; and making design decisions based on average part-worth values may result in a service offering that is far from optimal. Therefore, in our method to evaluate different levels of automation in a service design, we will take the full information of individual-level part-worth values estimated in the conjoint analysis. Unfortunately, the individual-level data cannot be presented here due to space limitation and data confidentiality reasons.

We use the SPSS conjoint choice simulator to predict not only preference (utility) but also choice probabilities for a particular service configuration among a set of real and/or hypothetical service offerings based on individual-level data. To do so, we need a choice rule, i.e. an assumption about how consumers translate preference into a choice decision. If one assumes for example that each customer chooses the offer with the maximum utility, we can predict probabilities of choosing each offer as the most preferred one among a set of alternative service offerings. This so-called first choice model determines the probability that a configuration is chosen as the number of respondents who extract the highest utility from this profile (and thus would choose it) divided by the total number of respondents. Since the first choice model is known to overestimate preference for the most attractive product and underestimates it for other products probabilistic choice rules have been introduced. The BTL (Bradley-Terry-Luce) model assumes that the choice probability is equal to the ratio of a product's utility to the total value of all products in the alternative set, averaged across all respondents. The logit model is similar to BTL but uses the exponential of the utilities instead of the utilities.

For the simulation we make the following assumptions: customers consider two alternative UC service providers to choose from: provider A representing “us” and provider B, a competitor. In all scenarios that follow, the competitor offers the service at a price 4% of the total investment, service initiation is through a call center, service delivery is handled manually.

In the base scenario representing the status quo (Scenario 0), provider A matches exactly the competitor’s service with its service offering. Thus, the current offers are least automated in both processes, service initiation and service delivery. Obviously, this will yield an expected market share of 50% for both players independent of which choice rule is assumed. Table 6 shows the result of the choice simulation. Each following scenario 1-9 describes the situation where provider A redesigns its service offer as described in the second column (while provider B is assumed to leave its offer as in the base scenario). In particular, service configurations are tested with varying levels of automation in the initiation and the delivery process. In most scenarios, the price is kept at 4% or increased to 5% (based on the conjoint data, a price reduction to 3% does not seem reasonable since customers do not really value the discount). Columns 3 to 5 show the simulated probabilities that the service of provider A is chosen under the three different choice rules (first choice, BTL and Logit) which may be interpreted as projected market shares. The competitor’s share corresponds to the complement (100% - share of provider A) and is not listed explicitly in the table.

Table 6. Simulated choice probabilities for different service design configurations (SI: Service initiation process, SD: service delivery process)

Scenario	**Service offer of provider A (“us”)**	**Choice Probabilities**		
		1st Choice	**BTL**	**Logit**
0	Price: 4%, SI: call center, SD: manual handling	50.0%	50.0%	50.0%
1	Price: 4%, SI: web portal, SD: manual handling	58.8%	55.9%	53.1%
2	Price: 4%, SI: autom. interface, SD: manual handling	47.1%	52.0%	48.4%
3	Price: 4%, SI: call center, SD: autom. IMACs	64.7%	56.4%	55.4%
4	Price: 4%, SI: web portal, SD: autom. IMACs	58.8%	57.0%	57.5%
5	Price: 4%, SI: autom. interface, SD: autom. IMACs	44.1%	52.7%	47.2%
6	**Price: 4%, SI: call center, SD: analytical tree**	**67.6%**	**61.2%**	**66.7%**
7	Price: 4%, SI: web portal, SD: analytical tree	58.8%	60.6%	61.9%
8	Price: 4%, SI: autom. Interface, SD: analytical tree	50.0%	56.4%	53.0%
9	Price: 5%, SI: call center, SD: analytical tree (3,1,3)	67.6%	59.7%	63.0%

According to Table 6, the service configuration most promising for provider A to offer with respect to market share is the one in Scenario 6, where service initiation is done traditionally via call center but service delivery is provided as a self-service with analytical trees. Thus, in redesigning the service configuration, automation is the initiation part of the service process should be rather low corresponding to the status-quo offer while the delivery part of the process should be much more automated. Provider A's projected share in the assumed two player market would increase from 50% to 61.2%-67.6% depending on which choice rule is assumed, while provider B would lose the corresponding shares. Since the price is kept constant at 4%, the gain in market share would directly translate into a proportional increase in expected revenue for provider A. Another attractive option for provider A could also be to fully automate service delivery and simultaneously increase prices to 5% (Scenario 9) even though the increase in market share will then be somewhat lower compared to Scenario 6, with shares ranging from 59.7% to 67.6%. Obviously there is a trade-off between price and market share with regard to revenue and the best balance can be determined by calculating revenue once market size and investment volume of each customer is known. In the long-term, the redesign in Scenario 6 or 9 should also be superior from a cost perspective because of the productivity gains that can be expected through the higher level of automation. Thus, in our case, automation in service delivery creates a win-win situation for both the service provider and the customer.

Until now, we only examined the "one-size-fits-all-solution", i.e. we assumed that all customers are offered the same service. In face of heterogeneity, this strategy is usually suboptimal. One strategy to better match customer needs and further increase market share in face of heterogeneity is to differentiate the service offering and customize it to different needs. For examples, one could think about keeping the service as modular as possible and offering different automation modes for service delivery such that a customer can choose either to help herself through an analytical tree or to use automated IMACs whatever she prefers. Technically, the underlying decision problem can be considered as a so-called product line design problem where multiple product or service configurations are offered in parallel [10]. The multi-product problem is much more complex due to its combinatorial nature. Furthermore, substituting cross-effects between different service offers have to be considered as well as detailed trade-offs in fixed costs for joint and dedicated resources needed for different automation technologies versus cost savings through increased productivity. Since it is beyond the scope of this paper, we leave the multi-product analysis and the question of how much differentiation and customization a service provider should offer with respect to automation to future research.

5 Conclusion

We conducted a conjoint analysis to learn about business customers' preferences for process automation in the UC service business. Customers seem to demand fast and reliable service from a service provider, and they are willing to take over easy tasks and accept automation in standard procedures. In addition, the customer seems to reward a plus in information with extended contribution and a shift of efforts from the service provider to the customer's IT.

The results of the conjoint analyses were further used in a choice simulator to evaluate different service designs with respect to market share. It turned out that automation can in fact be a win-win for both provider and customers if applied at the right levels and to the right business processes.

The interesting insights we could gain from the analysis encourage us to explore several future research opportunities. First, it seems worthwhile to collect more data, especially on management (CIO- or even CxO-level) level, to verify our findings. Furthermore, it might be of interest to investigate why the management segment has another focus than the operational staff and find out more about possible impact of pricing towards automation. In the current survey, respondents seem to not be very price sensitive, and it would be interesting to see whether there is a significant change in perception as the numbers for pricing are changed.

As already discussed earlier, we would also like to explore the more complex "multi-product" case where the provider opens up different channels of automation at the same time to better serve customers with heterogeneous needs. Second, the analysis should be continued further by taking costs into account and evaluate different service design from a profitability perspective. Although it will be challenging to collect and estimate the different types of variable and fixed costs related to automation, it seems the effort is worth it.

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