Towards assessing the value of digital self-service options from a provider perspective

Full Paper

Florian Baer
University of Rostock
florian.baer@uni-rostock.de

Michael Leyer
University of Rostock
michael.leyer@uni-rostock.de

Abstract

Given the ongoing digitization of service, understanding the value co-creation process in the self-service context is getting more and more relevant for practitioners and academics alike. Prior research on service co-production has primarily focused on the service beneficiaries' causal paths of value determination or has conceptualized value as utility relying on neo-classical economic concepts and theories. As a result, little is known about how to assess the value-in-experience of digital self-service options from a service provider's perspective. This study represents a first contribution towards answering this research question. Based on the results of a systematic literature review, we develop a framework that enables service organizations to assess the expected and perceived value before, during or after an actual service experience. It therefore conceptualizes value as net benefit and means-end. Drawing upon the framework, we discuss various value enhancement strategies reflecting different categories of self-service options.

Keywords

Self-service, E-service, Value assessment, Provider perspective.

Introduction

Due to rapid advances in information technology (IT) coupled with a continuous increase in labor costs and competition, digital self-service options have become more and more popular with service providers (Scherer et al. 2015). Digital self-service options can be defined as service processes of value co-creation facilitating an increase in the co-production of a digital service through shifting tasks from the service provider to customers (Haumann et al. 2015). They are performed in the form of workflows implemented in Self-Service Technologies (SSTs, e.g. web search engines, online banking and online shops), which are "[…] technological interfaces that enable customers to produce a service independent of direct service employee involvement" (Meuter et al. 2000, p. 50). Compared to personal service delivery channels, digital self-service options allow service providers to reduce costs of service delivery, while empowering customers to become partial employees (Scherer et al. 2015).

Prior research on SSTs has focused on the causal paths underlying the service beneficiaries' value determination (e.g. Bitner et al. 2002; Meuter et al. 2000). In this context, value is often conceptualized as perceived customer satisfaction (Ng and Smith 2012). However, for digital self-service options to be considered as being successful, they also have to create additional value for the service provider (Campbell et al. 2010). Poorly designed self-service options can increase providers' costs and thereby destroy provider value (Kumar and Telang 2011). Though, there is little research on how to assess value from a service provider perspective, related studies primarily conceptualize value as utility and rely on (neo-)classical economic concepts and theories (e.g. Tong and Rajagopalan 2014; Trinh et al. 2014). This, however, is not in line with recent theories and research streams on service, such as Service-Dominant (S-D) logic (Vargo and Lusch 2004) and Service Science (Maglio and Spohrer 2007). Here, it is argued that value is in phenomenological experience and "[…] resides, not in an object, a product, or a possession but rather in the use experience" (Ng and Smith 2012, p. 223). As understanding value determination is considered an important priority in service research (Ostrom et al. 2015), the study at hand provides a first contribution towards answering the following research question: *How to assess the value-in-experience of digital self-service options from a service provider perspective?*

To extend our understanding in this regard, we first concretize the current characterization of self-service options from a service operations management perspective. To do so, we distinguish them from traditional (full) service encounters on a service process level. This delineation forms the groundwork for our research, a framework for the (V)alue-in-experience (A)ssessment of (S)elf-(S)ervice options from a (P)rovider (P)erspective (VAS²P²). The framework draws upon the foundational premises of Service Science/S-D logic and its variables are identified based on a systematic literature review.

Research Methodology

To deepen our knowledge regarding the value determination of service providers in the context of digital self-service option, we conduct a systematic literature review following the procedure recommended by Webster and Watson (2002). We construct our search terms by deriving the population (digital self-service options), intervention (value assessment) and outcomes (causal relationships between relevant constructs) as major terms from our research question stated in the introductive section (Kitchenham 2004). Furthermore, for each major term, we identify alternative spellings and synonyms. Also, keywords in relevant literature already reviewed are checked. We focus on empirical studies (qualitative and quantitative) that deal with digital self-service options. Following this search strategy, Boolean search strings are designed and piloted.[1] The results are documented and reflected in an iterative procedure.

We apply the final set of search strings to EBSCO Business Source Premier using the integrated search feature, which include academic databases such as Emerald Insight, ScienceDirect, SpringerLink, JSTOR, ABI/INFORM Complete and PsycARTICLES. In a secondary search phase, we perform a forward and backward search to find additional articles that are relevant for our study (Webster and Watson 2002). Our sample initially consists of 327 studies from which we exclude studies not focusing on digital self-service options and examining only outcomes other than the ones of interest. Resulting from this exclusion, a total number of 22 articles is identified as being relevant.

Based on the results of the systematic literature review, we propose a mathematical framework for provider value assessment (VAS²P²) that aims to create directions for future research on this topic. The literature review's results are constructs that positively and negatively affect the service provider's (and the included customer's) value perception. The constructs are formalized through mathematical expressions and equations to include them in a mathematical model (VAS²P² framework) for provider value assessment. In the framework, value is conceptualized as net benefit and means-end. Thus, identified constructs that positively affect value perception are considered as benefits. Constructs that negatively affect the perceived value are considered as costs or sacrifices. Drawing upon the proposed mathematical model, we identify different value enhancement strategies, by means of increasing or decreasing the values of different subsets of variables (identified constructs), while keeping the values of the rest of the variables constant, and deriving the resulting provider value. Basically, each of the identified value enhancement strategies can be referred to a different category of self-service options.

Value determination of co-production processes

Theoretical Foundations

The involvement of customers in digital self-service options implies a co-production of service (Haumann et al. 2015). Co-production processes represent a special form of service processes, through which the operand (resources on which actions are performed to generate effects, e.g. goods) and operant (resources that act upon operand and/or other operant resources, e.g. knowledge and skills) resources of the customer are integrated with those of the service provider (Haumann et al. 2015; Hilton et al. 2013). The "[…] involvement in 'co-production' is optional and can vary from none at all to extensive co-production activities by the customer or user" (Vargo and Lusch 2007, p. 8). Co-production therefore has to be considered as a continuum, which "[…] relates to the degree to which the customer is active in doing something to achieve the desired outcome" (Hilton et al. 2013, p. 4). Shifting this degree in one direction or the other, decision makers aim to create additional value for their service organizations (Campbell et al. 2010).

[1] *A detailed description of the designed Boolean search strings can be obtained from the principal author upon request and the following link: https://goo.gl/O24VJs.*

Value can be conceptualized in various ways (Ng and Smith 2012), including net benefit and means-end (e.g. Campbell et al. 2010; Kwan and Müller-Gorchs 2011). For this research, we draw upon these two value concepts, as compared to other conceptualizations (e.g. economic worth and utility), "both types of value judgments are determined by the customer based on use (or potential) experience, often termed the consumption experience" (Ng and Smith 2012, p. 224). That being said, both concepts allow to assess the expected and perceived value-in-experience and thus can be seen as concretization of S-D logic's notion of value-in-use or context. The conceptualizations apply equally to the provider perspective (Campbell et al. 2010) and should be considered simultaneously, since "[…] value as evaluation of attributes is nested within value as the evaluation of outcomes […]" (Ng and Smith 2012, p. 224). Besides these two constructs, also in line with the fundamentals of S-D logic, is the firm-centric conception of value as perceived satisfaction. It is determined by customers during the service experience or ex post and represents an evaluation of the service's attributes (e.g. service quality or convenience) (Meuter et al. 2000).

Results of the Systematic Literature Review

As depicted in Table 1, there is only little research on value determination from a service provider perspective. The constructs discussed can be classified into four primary categories. Some of these constructs are considered in more than one study and vice versa.

Identified construct	Supporting study
Service efficiency (+)	(Bitner et al. 2002; Piotrowicz and Irani 2010; Salomann et al. 2007)
Customer satisfaction (+)	(Bitner et al. 2002; Salomann et al. 2007; Srivastava and Shainesh 2015)
Revenues (+)	(Haumann et al. 2015)
Provider characteristics (+)	(Haumann et al. 2015)

Table 1. Constructs to consider for value assessment from a provider perspective.

Service efficiency describes the relation between service outcome and input from the service provider perspective (Gersch et al. 2011). It thus can be considered as synonymous with service productivity (Grönroos and Ojasalo 2004). In the context of value co-creation, service efficiency can be divided into low cost and speed of delivery (Campbell et al. 2010). Potential cost reductions are seen as the primary reason for service providers to introduce self-service options (Bitner et al. 2002; Salomann et al. 2007). Decreasing cost of service delivery, a service organization is able to increase service productivity at constant revenues from a given service (Grönroos and Ojasalo 2004). The service price paid by a customer represents the firm's outcome of the service process (Haumann et al. 2015). Its input comprises an employees' knowledge and skills(operant resources) and the SST (operand resource) provided (Haumann et al. 2015). We summarize it as provider characteristics. Increasing speed of delivery positively influences service quality and satisfaction perceived by the customer (Collier and Kimes 2012; Shamdasani et al. 2008). As the latter also represents a separate construct category (Bitner et al. 2002; Salomann et al. 2007), it highlights the importance of customer value to the service provider's value assessment. Therefore, we further explore the constructs playing a pivotal role in the customer's value determination (see Table 2).

Speed of service delivery and perceived control have a strong influence on service quality perceptions (Shamdasani et al. 2008). Service quality evaluations in turn are important predictors of perceived customer value (e.g. Bauer et al. 2006; Bhatnagar and Singh 2010). A customer's perceived control can be seen as one dimension of customer empowerment (Alshibly and Chiong 2015), from each of which customers can derive co-created value separately (Harrison and Waite 2015). Convenience is considered a possible benefit that can be realized by customers adopting self-service options and refers to "[…] the ability to get something done quickly or at any time of the day or week […]" (Hilton et al. 2013, p. 5). Haumann et al. (2015) introduce the concept of co-production intensity, which is defined as "[…] customers' subjective perception of the extent of effort and time invested within a specific process of coproducing a product or service […]" (Haumann et al. 2015, pp. 17–18). Co-production intensity negatively affects a customer's satisfaction with the service process (Haumann et al. 2015). Further constructs to be considered include the complexity of the service tasks as well as the customer's characteristics (e.g. Kumar and Telang 2011; Sweeney et al. 2015), such as knowledge and skills, as these "[…] affect the value-in-context a customer can derive from a certain channel" (Scherer et al. 2015, p. 182). Also, the knowledge and skills of the service provider's personnel involved in the service encounter, need to be considered (see Table 1).

Identified construct	Supporting study
Speed of delivery (+)	(Hilton et al. 2013; Shamdasani et al. 2008; Collier and Kimes 2012; Xin Ding et al. 2007)
Control (+)	(Collier and Kimes 2012; Hilton et al. 2013; Scherer et al. 2015; Shamdasani et al. 2008; Wang and Wu 2014; Xin Ding et al. 2007)
Customer empowerment (+)	(Alshibly and Chiong 2015; Harrison and Waite 2015)
Service quality (+)	(Bauer et al. 2006; Bhatnagar and Singh 2010; Herington and Weaven 2009; Kwan and Müller-Gorchs 2011; Shamdasani et al. 2008)
Convenience (+)	(Collier and Kimes 2012; Hilton et al. 2013; Scherer et al. 2015)
Customer characteristics (+)	(Harrison and Waite 2015; Haumann et al. 2015; Hilton et al. 2013; Kumar and Telang 2011; Reinders et al. 2015; Scherer et al. 2015; Sweeney et al. 2015; Turner and Shockley 2014)
Activity requirements (-)	(Harrison and Waite 2015; Hilton et al. 2013; Kumar and Telang 2011; Scherer et al. 2015; Sweeney et al. 2015)
Co-production intensity (-)	(Haumann et al. 2015; Sweeney et al. 2015; Xin Ding et al. 2007)

Table 2. Constructs to consider for value assessment from a customer perspective.

In the following section, we describe how the identified constructs can be formalized via mathematical expressions and equations to arrange them in a mathematical model for provider value assessment.

Description of the VAS²P² framework

Digital Self-Service Options on a Service Process Level

A service process "[...] can be viewed as a chain or constellation of activities that allow the service to function effectively" (Bitner et al. 2008, p. 68). Accordingly, a service process represents a directed graph (Becker et al. 2009) that can be described by a vector of attributes $Sp = (Act, Flw, Cstr, Ety)$. A case example of a service process is provided by Gersch et al. (2011).

The set of activities that has to be performed by the entities within the service process, is denoted as $Act = \{act_1, act_2, \dots, act_n\}$, with $n \in \mathbb{N}$. Activity-performance requires specific knowledge and skills to be possessed or acquired by the process entity (Hilton et al. 2013). For instance, in order to prepare a tax declaration, one has to possess (at least general) knowledge in tax law. The more complex the activity to perform, the more difficult is its achievement (Scherer et al. 2015). Activity requirements can be defined as in Formalization (f) (see Table 3).

The control-flow $Flw \subseteq Act \times Act$ of a service process describes the execution order of the process activities through different constructors permitting flow of execution control (e.g. sequence, choice and parallelism) (van der Aalst et al. 2003). For each edge $(act_i, act_j) \in Flw$, which describes the directed path from act_i to act_j, there exists a constructor $\psi_{(act_i,act_j)} \in Cstr, \forall i,j \in \mathbb{N}, 1 \leq i,j \leq n$, with $|Cstr| = |Flw|$. A constructor $\psi_{(act_i,act_j)}$ represents a propositional formula. In case $\psi_{(act_i,act_j)} = 1$, the activity act_j follows the processing of activity act_i during runtime of the service process Sp.

$$\gamma_{act_i} = \begin{cases} 1, if\ (type_{ety}(actor_{act}(act_i)) = Customer \\ 0, otherwise \end{cases} \quad (1)$$

$$\delta_{act_i} = \begin{cases} 1, if\ (type_{ety}(actor_{act}(act_i)) = Service\ provider \\ 0, otherwise \end{cases} \quad (2)$$

A service process comprises at least two entities (e.g. provider and customer) (Campbell et al. 2010) that interact with each other through co-production to co-create mutual value (Spohrer and Kwan 2009). Entities involved in a service process Sp are described by $Ety = \{ety_1, ety_2, \dots, ety_s\}, \forall s \in \mathbb{N}, s \geq 2$. We define a type-function $type_{ety}: Ety \rightarrow Tp$, that assigns each involved entity $ety_t \in Ety$ to an entity type $tp_u \in Tp = \{tp_1, tp_2, \dots tp_v\}, \forall t,u,v \in \mathbb{N}, 1 \leq t \leq s, 1 \leq u \leq v$. Examples for entity types are (Spohrer and Kwan 2009):

service provider, customer and IT. To perform a process activity, process entities draw on a limited set of operant (e.g. knowledge and skills) and operand resources (e.g. tangible goods) (Hilton et al. 2013). The definition of these resources is provided by Formalization (b).

$$\gamma_{Sp} = \frac{\sum_{i=1}^{n} \gamma_{act_i}}{n} \quad (3) \qquad \delta_{Sp} = \frac{\sum_{i=1}^{n} \delta_{act_i}}{n} \quad (4)$$

To take the co-production degree into account, we differentiate process activities performed by the service provider, customer and IT. Therefore, we define an actor-function $actor_{act}: Act \rightarrow Ety$, which assigns each activity act_i to a service system entity ety_t. In combination, the type- and actor-function allow to examine whether a specific activity is performed by the service provider, customer or IT. We further define γ_{Sp} as the customer's co-production intensity (Haumann et al. 2015) representing the service beneficiaries' extent of non-monetary costs, such as effort and time investments, invested in a service process Sp. Thereby, γ_{Sp} also represents the degree to which a service process Sp should be considered as self-service. We calculate γ_{Sp} by adding up $\gamma_{act_i}, \forall act_i \in Act$. γ_{act_i} measures the customer's co-production intensity for a specific process activity act_i. For a process activity act_i we define Equation (1).

A process activity act_i is named self-service activity when it is performed by the customer ($\gamma_{act_i} = 1$). Based on Equation (1), the customer's co-production intensity for a service process Sp can be calculated as illustrated in Equation (3). Similar to γ_{Sp}, in Equation (4) we introduce δ_{Sp} as the service provider's intensity of co-production. Both constructs, γ_{Sp} as well as δ_{Sp}, range from 0 to 1: $0 \leq \gamma_{Sp}, \delta_{Sp} \leq 1$. We define a service process Sp as a digital self-service option when $\delta_{Sp} \leq \gamma_{Sp} \leq n - \varepsilon$, where ε specifies the degree of required digitization, with $\varepsilon \in \mathbb{N}, 0 < \varepsilon \leq n$. Hence, ε captures the amount of process activities, which have to be carried out by IT in order for Sp to be considered as digital. As there is no empirical evidence for how to specify ε provided by the service marketing and management literature, decision makers have to specify it themselves based on their experiences and expertise.

Value assessment of digital self-service options

According to the literature review's findings, customer value is an integral part of provider value. In its simplest form, both perspectives (provider and customer) of value can be assessed as follows: $Value = \frac{Total\ benefits}{Total\ costs}$ (Campbell et al. 2010; Kwan and Müller-Gorchs 2011). For VAS²P², we consider those identified constructs (see Table 1 and Table 2), which positively affect the provider's or customer's perceived value, as benefits. In contrast, identified constructs that negatively affect value perception are considered as costs or sacrifices. As the service provider and customer receive and deliver different kinds of benefits and sacrifices respectively, in the VAS²P² framework, the provider part and customer part of value are assessed separately in the beginning (see Equation (5) and (6)). In order to determine the overall provider value, the results of both parts are summated (see Equation (7) and (8)).

Table 3 relates the identified constructs to the resulting equations of VAS²P². An entity's non-monetary costs for activity-performance are calculated by the function $costs_{act_{non-mon}}: Act \rightarrow \mathbb{R}_0^+$, based on the activity's requirements (Formalization (f)) and the entity's characteristics (Formalization (b)). The higher the discrepancy between the characteristics and requirements, the higher these costs. The monetary costs (e.g. costs for operand resources required for activity-performance) are indicated by $costs_{act_{mon}}: Act \rightarrow \mathbb{R}_0^+$ and the service price (Formalization (a)). To allow for the measurement of the speed of delivery, a function $time_{act}: Act \rightarrow \mathbb{R}_0^+$ is defined, which also takes into account Formalization (b) and (f).

We make use of γ_{Sp} to measure the control dimension of customer empowerment. γ_{Sp} represents the degree to which a customer performs tasks within the service process and therefore to a certain extent the customer's control over the service process. Furthermore, we draw upon the concept of Service-Level-Agreements (SLAs), which are often defined in the context of digital services (Spohrer and Kwan 2009), and determine the level of convenience of a digital service. In this regard, we also consider the speed of service delivery (Hilton et al. 2013). Service quality is assessed according to the SERVQUAL instrument and therefore is influenced by the reliability (or probability) of delivering the demanded service successfully (Kwan and Müller-Gorchs 2011). We define reliability as $reliability_{act}: Act \rightarrow \mathbb{R}_0^+$ which compares the activity's requirements with the actor's characteristics. In case $0 \leq reliability_{act}(act_i) < 1$, the entity does not fulfill the activity's requirements (to the needed degree). The entity matches or exceeds the activity's

requirements, and thus is able to perform the activity dependably and accurately, when $reliability_{act}(act_i) \geq 1$.

Identified construct	Formalization in the framework
Service efficiency	see Equation (6)
Customer satisfaction	is indirectly assessed via service quality (see (d)); $P(CV) - E(CV)$
Revenues (price to be paid)	(a) $price_{Sp}(Sp)$
Entity (provider and customer) characteristics (set of operand (Ip_{od}) and operant (Ip_{ot}) input resources)	(b) $ety_t = \left\{Ip_{t_{od}} = \{(\omega_1, ip_1), (\omega_2, ip_2), \dots, (\omega_w, ip_w)\} \cup Ip_{t_{ot}} = \{(\omega_{w+1}, ip_{w+1}), (\omega_{w+2}, ip_{w+2}), \dots, (\omega_{w+z}, ip_{w+z})\}\right\}, \forall t, w, z \in \mathbb{N}; \omega_c \in [0;1]$ is the ability and willingness to provide $ip_c, \forall c \in [1; w+z] \in \mathbb{N}$
Speed of delivery	(c) $\sum_{i=1}^{n}\left(time_{act}(act_i)\right)$
Control	is assessed indirectly via the co-production intensity (see Equation (3))
Customer empowerment	is only assessed with regard to its control dimension (see Equation (3))
Service quality (according to the SERVQUAL instrument)	(d) $\frac{1}{\sum_{i=1}^{n}(time_{act}(act_i))} \times servqual \times \frac{\sum_{i=1}^{n}(reliability_{act}(act_i))}{n}$
Convenience	(e) $SLA \times \frac{1}{\sum_{i=1}^{n}(time_{act}(act_i))}$
Activity requirements (set of operand (Ip_{od}) and operant (Ip_{ot}) resources)	(f) $act_i = \left\{Req_{od} = \{(\rho_1, req_1), (\rho_2, req_1), \dots, (\rho_o, req_o)\} \cup Req_{ot} = \{(\rho_{o+1}, req_{o+1}), (\rho_{o+2}, req_{o+2}), \dots, (\rho_{o+p}, req_{o+p})\}\right\}, \forall i, o, p \in \mathbb{N}$
Co-production intensity	see Equation (3), (4); is multiplied with costs in Equation (5), (6)

Table 3. Identified constructs and corresponding formalizations in the VAS²P² framework.

Taking all these considerations into account, by means of multiplying and summating all the benefits and costs respectively, the expected value-in-experience of a service customer ($E(CV)$) as well as the perceived value-in-experience of a customer ($P(CV)$) can be assessed as illustrated in Equation (5). In case of $E(CV)$ the considered constructs, such as the customer's characteristics, calculated costs, speed of service delivery and service quality, represent expected and normative values. To assess $P(CV)$, a service organization has to determine these constructs, for instance, by making use of market research instruments and customer surveys after an actual customer experience. Nonetheless, in both cases, the customer's value-in-experience is estimated or determined.

$$E(CV), P(CV) = \frac{\gamma_{Sp} \times SLA \times \frac{1}{\sum_{i=1}^{n}\left(time_{act}(act_i)\right)} \times servqual \times \frac{\sum_{i=1}^{n}\left(reliability_{act}(act_i)\right)}{n}}{\sum_{i=1}^{n}\left(\gamma_{act_i} \times costs_{act_{mon}}(act_i)\right) + \sum_{i=1}^{n}\left(\gamma_{act_i} \times costs_{act_{non-mon}}(act_i)\right) + price_{Sp}(Sp)} \quad (5)$$

where,

$y_{act_i} \in [0;1] \in \mathbb{N}$ represents the customer's intensity of co-production on activity level,

$0 \leq \gamma_{Sp} \leq 1$ is the co-production intensity of service process Sp,

$0 \leq SLA \leq 1$ is the Service Level Agreement proposed in the value proposition,

$servqual \in \mathbb{R}_0^+$, those dimensions of the SERVQUAL instrument relevant to full services: assurance, tangibles and empathy.

A part of the service provider's value-in-experience can be assessed as illustrated in Equation (6). As the cost and time dimensions of service efficiency are already considered in the denominator of Equation (6) and Equation (5) respectively, we do not explicitly take this construct into account. Also, the provider's

and customer's characteristics are indirectly included in our definition of monetary and non-monetary costs. Thus, in Equation (6), we only explicitly account for the price that has to be paid for the service process and non-economical factor π. The latter represents the fact, that there are services which are provided for non-economic reasons and no value-in-exchange, such as services provided by non-profit organizations or services provided to internal customers. π can be used to measure cost improvements (compared to personal service delivery channels, e.g. a reduction in labor, facilities and equipment) achieved through the introduction of the digital self-service option.

$$E(PV_{Partial}), P(PV_{Partial}) = \frac{price_{Sp}(Sp) + \pi}{\sum_{i=1}^{n}\left(\delta_{act_i} \times costs_{act_{mon}}(act_i)\right) + \sum_{i=1}^{n}\left(\delta_{act_i} \times costs_{act_{non-mon}}(act_i)\right)} \quad (6)$$

where,

$price_{Sp}(Sp) \in \mathbb{R}_0^+$ determines the price that has to be paid for the service by the customer,

$\pi \in \mathbb{R}_0^+$ is the non-economical factor that has to be defined by the decision makers for Sp.

Taking both into account, Equation (5) and (6), the total expected and perceived value-in-experience from a service provider perspective can be assessed as depicted in Equation (7) and (8) respectively.

$$E(PV) = E(CV) + E(PV_{Partial}) \quad (7)$$

$$P(PV) = \left(P(CV) - E(CV)\right) + \left(P(PV_{Partial}) - E(PV_{Partial})\right) \quad (8)$$

Based on these overall equations, we identify a number of strategies and self-service option categories for increasing the expected and perceived value in the next section.

Categorization of Self-Service Options

In order to increase their value, service organizations are able to design and implement different kinds of self-service options. With regard to Equation (7) and (8), the categories of self-service options can be seen as strategies for value increase. In Table 4, possibilities for value enhancement are illustrated, which can be implemented as part of the (re-)design and implementation phase.

Strategy implementation	Self-service option category
(I) $y_{Sp} \rightarrow 1$ + Strategies (II), (III), (IV)	Manual self-service options
(II) Convenience $\rightarrow \infty$; $\varepsilon \rightarrow n$	Digital self-service options
(III) $servqual \rightarrow \infty$	On-site self-service options
(IV) $reliability_{act}(act_i) \rightarrow \infty, \forall i \in \mathbb{N}, 1 \leq i \leq n$	Simple self-service options
(V) $price_{Sp}(Sp) \rightarrow 0$	Free self-service options
(VI) $price_{Sp}(Sp) \rightarrow \infty$ + Strategies (II), (III), (IV)	Precious self-service options

Table 4. Strategies and self-service categories to increase a service provider's value.

Manual self-service options (e.g. traditional supermarkets) require the customer to perform most of the process activities manually. Service providers introducing manual self-service options, aim to reduce their total costs by increasing the customers' co-production intensity. However, as this also increases the customers' total costs, Strategy (I) only increases the service provider's value in conjunction with either one or all of the Strategies (II), (III) and (IV). Enabling the service customer to perform all tasks within the service process by himself, increases the factor of customer empowerment measured by γ_{Sp}. To compensate this increase, a service provider can, for instance, also increase the expected convenience: $SLA \times \frac{1}{\sum_{i=1}^{n}(time_{act}(act_i))}$. Increasing the local and timely availability as well as the speed of service delivery to its maximum, this requires the service to be digital (Collier and Kimes 2012; Meuter et al. 2000). Hence, the service provider needs to design and implement a digital self-service option (e.g. an online shop), as technology provides a greater local and timely availability as well as faster task processing. Within digital self-service options, the majority of the process activities are performed by IT (in case of: $\varepsilon \geq \frac{n}{2}$).

Another strategy refers to the increase of those dimensions of service quality (according to the SERVQUAL instrument) that need to be considered in personal service interactions. For instance, the service provider can decide to offer the relevant SSTs in his facilities to provide personnel supporting customers using these service channels as well as a positive servicescape (on-site self-service options, e.g. ticket machines at subway stations). Besides these factors, also reliability contributes to an increase of the overall service quality. To increase reliability, service providers can either simplify the process activities, in terms of reducing their requirements posed to the customer performing them or otherwise train the customers, so the operant resources (e.g. knowledge and skills) they are able to provide for task-performance match or even exceed the activities' requirements (Kumar and Telang 2011; Scherer et al. 2015). Such a strategy would refer to simple self-service options (Strategy (IV), e.g. websites answering frequently asked questions).

Furthermore, a service provider can vary the price that has to be paid by customers for producing the demanded service. Reducing the price to zero would make the self-service option free for customers, in terms that there is no direct value-in-exchange (Strategy (V), e.g. self-service options offered to internal customers). However, this only increases value, in case this would not lead to any additional effort (costs) for the service provider. A service provider could also increase the price for the service to a maximum in order to increase its part of the overall value and design and implement a kind of precious self-service option (Strategy (VI), e.g. experience gift vouchers for do-it-yourself experiences). Nevertheless, as this would increase the costs for the service customer, such a strategy also requires support from either one or all of the Strategies (II), (III) and (IV) (Haumann et al. 2015).

Conclusions, Limitations and Future Research

This study proposes the VAS²P² framework for the value assessment from a provider perspective. In particular, VAS²P² allows service providers to assess the expected value-in-experience as well as the perceived value during or after an actual service experience. The framework conceptualizes value as net benefit and means-end (Ng and Smith 2012). Therefore, it considers a number of constructs that are identified by a systematic review of service marketing and (operations-)management literature.

The present research makes several contributions to extant literature by implying a set of theoretical propositions. First, we conceptualize self-service options on a service process level. In particular, self-service options are defined as co-production processes implemented in SSTs and it is proposed to formalize these processes in form of directed graphs (a quadruple of activities, process flow, constructors and entities) (P1). Second, the study formalizes provider value in the context of digital self-service option through a mathematical equation. It is proposed that in this context, perceived provider value is the sum of the service provider's height of goal achievement ($P(PV_{Partial}) - E(PV_{Partial})$) and customer satisfaction ($P(CV) - E(CV)$) (P2). Third, and finally, altering the framework's variables, various strategies for value enhancement are identified. These strategies represent different self-service option categories. The following categories are proposed (P3): manual, digital, on-site, simple, free and precious.

Practitioners can make use of VAS²P² in order to determine the perceived value based on an actual service experience, but also to identify different self-service strategies during the design and implementation phase and calculate the expected value. Hence, it supports decision makers in deciding whether to transfer the performance of specific service process tasks to customers or not. Decision makers therefore can apply VAS²P² to design and implement effective digital self-service options. As the concept of self-service is an integral part of digital service, the study's results provide great benefits to service organizations. The assessed provider value determines whether to digitize a given service or not.

However, the results of the present study and its contributions to both research and practice, have to be evaluated in lights of its limitations. VAS²P² comprises a set of functions, including $costs_{act_{mon}}: Act \rightarrow \mathbb{R}_0^+$, $costs_{act_{non-mon}}: Act \rightarrow \mathbb{R}_0^+$ and $reliability_{act}: Act \rightarrow \mathbb{R}_0^+$. Yet, for this research we only defined the constructors of these functions. Hence, the functions currently present some kinds of black boxes, which have to be defined in more detail in future research. By fully specifying the set of functions, VAS²P² can be integrated into existing service process modeling and analysis tools. For instance, the framework can be integrated into the Service Blueprinting approach (Bitner et al. 2008) to exceed the determination of service quality from a time dimension allowing for the prediction and assessment of the value-in-experience. Also, future work could make use of the literature review's results, to perform a quantitative meta-analysis.

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