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Title: **THE VALUE OF HUMAN INTERACTION IN SERVICE CHANNELS**

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The value of human interaction in service channels

Abstract

The influence of digitalisation on service experiences requires new capabilities from customers. In particular, the computer-mediated interaction affects customers' perceived accessibility into self-services. Thus, we posed the following research question: "How does an individual's ability to use a computer influence the need for direct person-to-person interaction in services?" The study is based on a postal survey conducted in south-eastern Finland. Data were collected using a random sample of $N = 3,000$ people ranging from 60 to 90 years of age. A total of 1,121 valid responses were received. The data were slightly biased towards respondents who are coping well. We employed structural equation modelling with a multi-group moderation approach in the analysis.

The findings indicate that satisfaction is related to routines in the service process. Customers' ability to perform the requisite role in the service process influences their preference for human interaction. Interestingly, the value of human interaction is driven by customers' expected abilities, whereas physical restrictions have a minor influence. We contribute to the literature explaining co-creation in computer-mediated services by applying human behaviour models to assess the customers' value expectations.

Keywords Customer value, Service channel, Online and offline channels, Consumer behaviour, Technology acceptance, Human interaction

1 Introduction

A service is a collaboration process to integrate internal capabilities of actors into external ones during which customers actively participate in value co-creation (Barrett *et al.*, 2015; Flores and Vasquez-Parraga, 2015; Vargo *et al.*, 2008). Co-creation is fundamental for service-dominant logic in which the customer's contribution is an essential part of the process. Contribution refers to the interactions before and during the service process, when the customer actively co-creates value by providing information, rights, activities and physical objects for the service provider (Fliess *et al.*, 2014; Fließ and Kleinaltenkamp, 2004). The interactions between the customer and the service provider take place in service channels. The preference for technology-mediated services or human interaction depends on the compatibility of the particular interface with a person's capability, the available technologies and the customer's role in the required task. Instead of a growing number of different internet-based service platforms emerging in both public and private sectors, the interaction preferences are overlooked premises of the services. Based on empirical evidence, digitalisation has raised new accessibility issues which may restrict some customers from using the services due to behavioural burdens (Goins *et al.*, 2005; Wellstood *et al.*, 2006).

At present, researchers are limited in explaining the intention to use to technology-based service due to the lack of discussion on the preferences for electronic versus human-to-human service channels. Open questions exist in the literature regarding the link between perceived control to use particular service channels and the requirements for customers to contribute to the service process (Fliess *et al.*, 2014). In this study, we have emphasised the relational value experience of the service process. We explain the link between direct human-to-human interaction and the value-creation potential of service encounters. The value in these circumstances is measured by the customers' sense of enjoyment from developing relationships through the process of co-creation (Flores and Vasquez-Parraga, 2015). We also

connect value creation to personal capability requirements to explain why human interaction often improves customers' service experience. To challenge the digitalisation trend, we pose the following research question: "How does an individual's ability to use a computer influence the customer's need for direct person-to-person interaction in services?"

Focusing the present study on human interaction provides two beneficial paths to approach the value co-creation phenomenon. First, at the customer level, the need for human contact during the service process is a relevant factor in predicting customers' use of self-service technologies, which explains channel preferences (Aslanzadeh and Keating, 2014). Second, the present study increases the system-level understanding of users' capability requirements in different service channels, which defines the frame for value co-creation (Breidbach *et al.*, 2013). The technology acceptance model provides the basis for understanding situational and human factors that may change consumers' decision of either a self-service technology or human-to-human interaction for the service channel (Lee and Lyu, 2016). We apply several concepts related to service usage behaviour, technology use capabilities and users' health status. We have developed a research model that considers the relations among the value of human interaction, service self-efficacy, perceived physical restrictions regarding computer use and perceived behavioural control over a computer. We have tested the research model with empirical data collected via a postal survey of a random sample of 3,000 people ranging from 60 to 90 years of age. A total of 1,121 valid responses were received. We employed structural equation modelling. Furthermore, we conducted a multi-group analysis to test the influence of self-rated cognitive function and self-rated health.

The service channel's relational attributes influence customers' overall value experience, which is discussed in relation to service-dominant logic. We conclude that the need for human interaction drives the customer's control over the service process and self-efficacy. Here, the findings indicate the existence of requirements regarding customers' cognitive and

physical capabilities of using services effectively in digital channels (Fliess *et al.*, 2014). A customer's cognitive capabilities are meaningful if his or her accumulated experience and familiarity foster effective use later (Chiu and Hofer, 2015; Collier *et al.*, 2015). We contribute to the service-dominant logic by providing an analytical approach to assess person-related features' impact on the relevance of the service channels, which either foster or hinder customers' contribution to co-creating value.

The article is structured as follows. First, we review the conceptual background of value co-creation and describe process and service channel-related concepts. Second, we build the research model and hypothesis to illustrate the factors that drive the expected value of human interaction. Third, we describe the research approach and then present the results of the empirical study. Finally, we draw conclusions about aging users' service provision behaviour and the policy implications.

2 Conceptual background of value co-creation

To understand value co-creation in services, we need to define customers' contribution in relation to the service process and the service channel. The service-process perspective clarifies the meaning of a customer's role in co-creating value, whereas the service-channel perspective links the service process to the customer's expectation of value.

2.1 Customers' contribution to the value co-creation process

Customers' contributions are an essential part of the service process in which they actively co-create value by providing information, rights, activities and physical objects for the service provider (Fliess *et al.*, 2014; Fließ and Kleinaltenkamp, 2004). For this purpose, various forms of customer participation activities are embedded in service operations in the airline, banking, hotel, retail and health industries. The successful implementation of such service activities depends mainly on two factors: (1) the clarity of the actions taken by the

customer and (2) the appropriateness of the service channel for the particular purpose. The central concept for co-creation is the service channel, or customer interface, which is visible to the customer. The interfaces can be either digital or carried out in direct human-to-human interaction depending on the complexity of the service-related task. Digitalisation refers to self-service options supported by self-service technologies (SSTs). SSTs are technological interfaces that enable customers to produce a service independent of the direct involvement of service employees (Meuter *et al.*, 2000). SSTs encompass a broad range of service channels and types, such as ATMs, kiosks, internet/online and measuring technologies (e.g. blood-pressure meters in health care). Previous studies have categorised the types of SSTs as “onsite” and “offsite” (Dabholkar and Bagozzi, 2002), “internet” and “non-internet” (Forbes, 2008) and “public” and “private” (Collier *et al.*, 2014).

The breadth and depth of customers’ participation roles in the co-creation of value may vary, and many concepts, including customer involvement (Mittal, 1995), participation (Bolton and Saxena-Iyer, 2009) and engagement (Brodie *et al.*, 2011), have been introduced to explain the phenomenon. Involvement is often defined as an individual’s level of interest and personal relevance in relation to a focal object or decision (e.g. to select a service channel) explained through basic values, goals and self-concept (Mittal, 1995; Brodie *et al.*, 2011). In turn, participation emphasises the role differences customers might have in services; that is, it takes into account the degree to which customers produce and deliver a service (Bolton and Saxena-Iyer, 2009; Brodie *et al.*, 2011). Further, the concept of customer engagement, which is heavily rooted in the service-dominant logic and relationship marketing, is defined as “a psychological state that occurs by virtue of interactive, co-creative customer experiences with a focal agent/object (e.g. a brand) in focal service relationships” (Brodie *et al.*, 2011). Other relational concepts, such as involvement or participation, represent specific customer engagement antecedents and/or consequences. Moreover, customers’ role in service

operations may also shift from a traditional payer role towards a service-provider role in which customer communities co-create value in peer networks and the service provider facilitates the process. Customers' service-channel preferences or role depends on their capabilities and volume and the complexity of their activities in the service process (Sousa *et al.*, 2015). Customers' readiness to perform a particular role in either self-service or in a human interaction influences the value co-creation process positively or negatively directs the overall net value of the experience (Verleye, 2015). Regarding role readiness, individuals' personal capabilities and physical or cognitive restrictions influence expected usefulness of the service because the interface design influences customers' value co-creation abilities by defining interaction experiences (Flores and Vasquez-Parraga, 2015). Therefore, fostering direct human-to-human interactions may increase the value for the customer, and creating multichannel strategies is a preferable option for service providers.

2.2 Service channels as a source of value

A customer experiences the value of a service through the social benefits connected with peers, personal status benefits, cognitive and learning benefits, pragmatic benefits related to personal needs, economic benefits and hedonic benefits of pleasurable service experiences (Verleye, 2015). To summarise, the service value for the customer is based on (1) the perceived benefits related to accomplishing requisite tasks during the process or (2) the gains experienced at an emotional level. More generally, the benefits noted by customers include greater efficiency in a transaction (Collier and Kimes, 2013; Dabholkar *et al.*, 2003) and emotional and hedonic benefits (Collier and Barnes, 2015).

The process perspective on value co-creation assesses the efficiency of the activities carried out by the customer or the service provider. The efficiency can be evaluated by the benefits related to the transaction or by the reduced sacrifices before the actual service encounter. In

many cases, customers choose a self-service option based on the perceived benefits of performing the transaction by themselves (Collier and Barnes, 2015). Self-service is also related to increasing the availability of a service whilst lowering costs (Collier *et al.*, 2014). Digital service channels in particular influence services' availability because the actors' physical locations in the service systems are less relevant, which decreases the travel burden to use a range of services (Breidbach *et al.*, 2013). Service providers offer self-service options to either replace or complement human-based services because of the cost savings, market pressure, operational efficiency and prevention of service failures (Oh *et al.*, 2012; Oh *et al.*, 2016; Chang and Yang, 2008).

Individual customers create their perceptions into services through multiple dimensions such as cognitive, emotional and social experiences (Immonen and Sintonen, 2016; Mohd-Any *et al.*, 2015). The experience is particularly noteworthy in a complex interaction for co-creating value, which makes a distinction between whether a social interaction needs to take place between the customer and the other actors during the self-service experience (Collier *et al.*, 2014). The influence of social interactions on the value of the experience is a culture-related feature requiring a wider understanding of the service context and customer behaviour (Akaka *et al.*, 2015). Social interactions, which also contribute to the experience in the value co-creation context, may occur between the customer and the service provider, or they can create patterns of peer-to-peer value co-creation (Rihova *et al.*, 2013). In these circumstances, at best, the service provider can improve the value of the experience by providing facilities and human-to-human interaction opportunities for customers (Rihova *et al.*, 2013). Therefore, multichannel service strategies improve the value for the customer, whereas offline services provide flexibility in interactions (Aslanzadeh and Keating, 2014).

3 The value of human contact in services: the research model

The research model to explain the value of direct interaction in services encounters amongst aging users includes three parts: the factors relating to service usage behaviour, the factors describing technology use capabilities and the factors illustrating the users' health. The concepts applied in the study are the value of the human interaction, service self-efficacy, perceived physical restrictions regarding computer use and perceived behavioural control over a computer. We discuss the relations between the concepts with the hypotheses presented in the following sections (Figure 1).

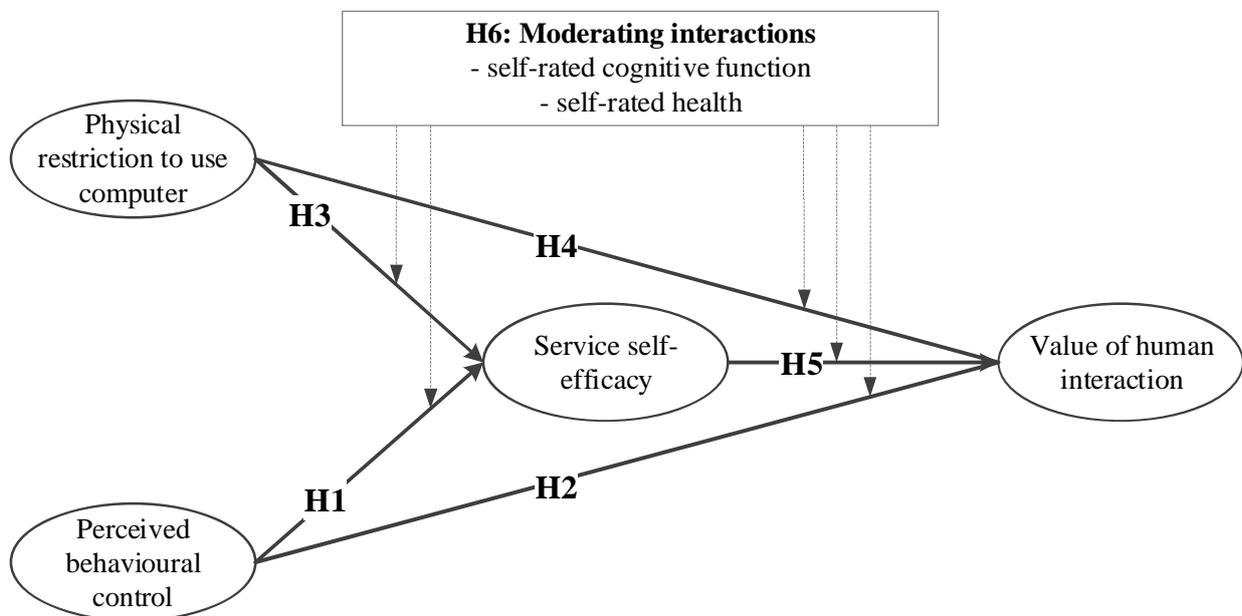


Figure 1. The theoretical model that explains the value of human interaction in services

3.1 Perceptions of service value co-creation in human-to-human interaction

The perceived value of a service is related to individuals' assumed rational behaviour and subjective assessment of the net value, which equals the perceived benefits and sacrifices (Venkatesh *et al.*, 2003). Thus, the perceived value is an outcome expectation that influences satisfaction and willingness to continue usage (Gounaris *et al.*, 2007; Heinonen, 2004). In a frequently used service, customers assess the benefits related to the service's fit to daily

routines, convenience of use and decreased sacrifices required which all highlight the value-in-use and the accessibility of the service (Heinonen *et al.*, 2013; Shih and Fang, 2004)

The interaction between the customer and the service provider follows a script that includes predefined roles between the actors and the expected actions of the parties during the service process. The customers' activities related to the service include core service activities, the related preparation activity and other activities needed before the service is realised (Heinonen *et al.*, 2013). To create value for the customer, all the listed activities must be relevant for the customer who is assessing them against personal capabilities and learned behaviour (Mickelsson, 2013). Thus, customers' preferences for technology-mediated communication or human interaction in the service channel are linked to their satisfaction through the convenience of the service process. Direct human interaction creates value in the service if the customer experiences relational value as a sense of enjoyment from developing relationships with the service provider or avoiding mistakes in the service (Flores and Vasquez-Parraga, 2015). Therefore, direct human interactions improve the quality of the experience if social ties to the service provider help avoid connective gaps (Breidbach *et al.*, 2013).

3.2 Influence of perceived behavioural control over technology on service usage beliefs

Customers' attitudes towards computers, in general, predict their understanding of computers and experience, which create knowledge-based and motivation-based barriers to the use of self-service platforms (Potosky and Bobko, 1998). The motivation to use self-service technologies is related to customers' perceived behavioural control, which is based on their capability to perform tasks in relation to the value co-creation process (Ajzen, 1991; Glass and Knight, 1988). In service usage, expected complexity activities direct customers' choices

between self-service channels and human interaction because their perceived value is based on the expected net benefit (Sousa *et al.*, 2015).

Problems co-creating value frequently increase the time spent by both parties, in particular if the customer's ability to communicate with the service provider is limited (Scherer *et al.*, 2015). Technology might be avoided due to interface design issues or a lack of facilitating services and guidance needed to perform the required tasks (LeRouge *et al.*, 2014). Paid efforts in communication during the value co-creation process influences customers' perceived sacrifices, whereas easy participation leads to higher intentions to become involved in the process without counterproductive effects on the net value (Mohd-Any *et al.*, 2015). However, human interaction in services is preferred by customers who perceive human interactions as more reliable and less time-consuming (Collier and Kimes, 2013; Makarem *et al.*, 2009).

Hypothesis 1: Perceived behavioural control over technology influences service self-efficacy.

Hypothesis 2: Perceived behavioural control over technology influences the value of direct human interaction in service events.

3.3 Influence of physical restrictions regarding computer use on service usage beliefs

In addition to customers' perceived behavioural control over the self-service process, their physical capabilities cannot be neglected as a factor influencing value co-creation. Neither cognitive nor chronological age is a predictor of the use of a technology-supported service channel, but customers' health and physical functioning have a significant influence on their perceived capability to accomplish the required tasks (Heart and Kalderon, 2013; Szmigin and Carrigan, 2000; Vuori and Holmlund-Rytkönen, 2005).

In relation to individual characteristics, functional ability is one determinant that influences a person's ability to adopt new technology (Hu *et al.*, 2003; Kher *et al.*, 2013; Kim and Glassman, 2013; Sintonen and Immonen, 2013; Chang *et al.*, 2015a, 2015b). Therefore, it is important to note that even a mild natural functional decline may decrease an individual's motor, hearing or vision capabilities, resulting in an inability to adapt information from changed user environments (Harper *et al.*, 2011) and thus influencing his or her ability to use self-service technologies with different interfaces. Today, multiple service channels are readily available for most customers at an accessible price, but the perceived physical accessibility to the service systems should be considered carefully (Immonen and Sintonen, 2015; Karahanna and Straub, 1999).

Hypothesis 3: Physical restrictions regarding computer use influence service self-efficacy.

Hypothesis 4: Physical restrictions regarding computer use influence the value of direct human interaction in service events.

3.4 Influence of service self-efficacy on self-service orientation

Service self-efficacy is an individual's belief in his or her personal capability to perform service-related tasks independently. The tasks for creating value in services may consist of activities for customers ranging from physical tasks to information-searching and decision-making (Fellsson and Salomonson, 2016). The net value of the activities is dependent on the perceived efforts and convenience, which affect whether a customer undertakes an activity (Lee and Lyu, 2016; Ajzen and Madden, 1986; Compeau and Higgins, 1995). Because the experience of the convenience of a particular service channel is grounded in the appropriateness of the activities, self-efficacy affects the experience of value and satisfaction (Mohd-Any *et al.*, 2015; Wang *et al.*, 2013).

Due to the dependence of the perceived value on convenience and efficacy, customers' preferences for certain service channels are derived from their expected effectiveness, which leads, in some cases, to an emphasis on a direct human relationship and facilitated service encounters (Collier *et al.*, 2015). This feature of service channel selection is particularly meaningful in the case of completely new services (Chiu and Hofer, 2015). However, service channel preferences are also dependent on customers' willingness to be a part of the service provision and to have an active role in the search for and sharing of information (Paluch and Blut, 2013).

Hypothesis 5: Service self-efficacy influences the value of human interaction in service events.

3.5 Moderating influences of self-rated cognitive function and health

Cognitive gaps reduce a customer's perceived value if the customer is not able to communicate his or her requests to the service system (Felleson and Salomonson, 2016). In practise, the service channel's fit to customers' needs and capabilities is the key for co-creating value because the channel provides the gateway connecting the customer and the service provider. The inappropriate design of service channels creates connective gaps that limit customers' ability to perform roles (Breidbach *et al.*, 2013). The customer's role readiness depends on the persons' ability to accomplish evaluation activities and the requisite task in the service process which sets requirements for cognitive capabilities and health status (Fliess *et al.*, 2014).

The clarity of the service process and understandable responsibilities of the actors are key factors that define the service channel's appropriateness for customers who have diverse cognition and health statuses (Fliess *et al.*, 2014). Due to differences in capabilities, providing alternative channels for customers to engage in value co-creation, such as self-

service or human interaction, increases the convenience of the service and has positive effects on the perceived net value (Flores and Vasquez-Parraga, 2015). However, multichannel services must pay particular attention to secure consistent and understandable information in self-service channels and human-to-human service encounters. Inconsistent information in self-service and personal-service channels increases customers' cognitive load, which has detrimental effects on the net value, particularly if the self-service channels are not capable of answering a customer's requests (Scherer *et al.*, 2015).

Hypothesis 6: Self-rated cognitive function and health statuses moderate factors that influence the value of human interaction and service self-efficacy.

4 Methodology

4.1 Research approach

We employed structural equation modelling to test the proposed hypothesis empirically and confirmatory factor analysis to verify the measurement model, which includes the operationalisation of the concepts in the theory. We applied the LISREL software package for data analysis. For the structural model, we used polychoric correlations with asymptotic covariances as the input data due to the ordinal nature of the variables (Olsson, 1979; Rigdon, 1998). The estimation method was unweighted least squares, which makes no assumptions about the distribution of observed variables (Long, 1983).

In addition to the basic model, a multi-group analysis approach was applied to test the potential influence of cognitive function and health. The respondents were first divided into two groups based on their self-rated cognitive function and then based on their self-rated health. For the multi-group analyses, the measurement invariance was confirmed, which means that confirmatory factor analysis has been conducted simultaneously for the groups (e.g. Byrne, 1998). Measurement invariance analysis is based on (1) configural invariance

(the composition of the measurement model should be the same in both groups), (2) metric invariance (requires equal factor loadings) and (3) factor variance invariance (Atienza *et al.*, 2003; Byrne and Miller, 2009).

4.2 Data collection

The empirical evidence was collected in a postal survey targeting 60- to 90-year-old residents of rural and suburban areas of south-eastern Finland. The target areas were defined by postal codes, and the total target population was slightly more than 79,000 people. A stratified random sample of 3,000 people was drawn from the Finnish Population Register. The sample frame was based on the population age distribution divided into 5-year categories (Table I). A total of 1,121 valid responses were received, and the effective sample used in the analysis was 1,006 because of incomplete responses. The age and gender distributions were representative of the true population. The age group fit the true population, and the share of female respondents was 53.8% (55.1% of the overall population), which slightly underemphasises women. The potential biases were caused by non-respondents' health status, as most of the non-respondents represent the elderly members of the population who are best or least able to cope.

Table I. Respondents' descriptive information

		<i>% of sample</i>
<i>Gender</i>	Male	46.2
	Female	53.8
<i>Age</i>	60–64	26.1
	65–69	30
	70–74	11.4
	75–79	7.9
	80–84	14.7
	85–90	9.9

4.3 Questionnaire development

The main theoretical concepts included in the research model were operationalised in the survey instruments. The measurement scales were as short as possible to maximise the number of completed responses and to avoid frustrating the respondents. The items in the survey were measured with statements using a seven-point Likert scale that varied from complete disagreement to complete agreement. The operationalisations of the theoretical concepts are presented in Table II, which include the wording of each statement.

Value of human interaction (VHI) in service encounters measures the expected convenience of direct experience. Measuring customer perceived value is known to be difficult, as the balance between the influential attributes changes over time (Jüttner *et al.*, 2007; Woodall, 2003). Customers focus on technical features and monetary value during the evaluation phase, whilst functionality and overall experience are dominant factors during the use and repurchase phases (Ancarani, 2009). Here, the relative advantage perspective into the customers' value experience directs to explain whether the product or service solves specific needs or decreases inconvenience and sacrifices (Shih and Fang, 2004). A three-item scale measured an individual's view of the expected convenience and enjoyment of using specific service channels that feature human contact (Gelderman *et al.*, 2011; Verleye, 2015).

Service self-efficacy (SSE) in accomplishing a technology-supported activity independently is an individual's belief in his or her capability to perform a behaviour that influences the decision to undertake activities (Compeau and Higgins, 1995). A person who has a pessimistic view of his or her self-efficacy may never try and, thus, may fail to find out that he or she was wrong (Ajzen and Madden, 1986). In general, self-efficacy is based on beliefs about the presence or absence of requisite resources and opportunities that are also seen as critical to inequality in contrast to the provided alternatives (Ajzen and Madden, 1986; Hsieh *et al.*, 2008). Digital services especially require customers to actively choose between a self-service and a human-to-human service channels depending on their attitudes and the expected

fluency of the process during the service (Pavlou and Fygenon, 2006). Thus, service self-efficacy also describes the customer's readiness for a new role, which is a significant driver of the adoption of different channels into services. In this study, SSE was measured using a scale that probes a respondent's confidence to accomplish service-specific tasks if facilitating services (i.e. customer support, guidance or instructions) and time resources are available.

Perceived behavioural control over technology (PBC) describes a customer's perceptions of the ease of performing a particular behaviour to accomplish a task (Ajzen, 1991). The two items selected for measuring perceived behavioural control were based on studies by Morris and Venkatesh (2000) and Taylor and Todd (1995). Revisions were made to match the present context.

Physical restrictions (PR) regarding computer use and other self-service technology describes the degree of problems associated with the visual or motoric requirements. The empirical evidence shows that even a mild decline in motoric, hearing or vision has a negative influence on a customer's ability to adapt information from changed environments (Harper *et al.*, 2011). To assess PR regarding computer use, device-related usability problems should be viewed from input device-related problems, the ability to understand the screen content and the overall experience as obstacles to efficient use that are all dependent on the user's individualised need (Agree, 2014; Billi *et al.*, 2010; Brewster, 2002). We applied a three-item scale to reflect these features to assess the usage difficulties related to the keyboard and the size of the screen.

Self-rated cognitive (SRC) function describes an individual's self-concept of memory and concentration, that is, metacognition. Metacognition is a multidimensional capability covering self-rated memory, concentration and learning ability, which are also essential for the adoption of the efficient use of new service channels (Klusmann *et al.*, 2011). In this

article, the scale measures two dimensions; i) the recognised changes in cognition of and ii) perceived harm of cognitive decline for the respondent. Previous literature has shown that self-rated scales are applicable if the respondents have a slight decline in cognitive function (Buckley *et al.*, 2010). We based the adapted measurement scale for the SRC on the World Health Organisation's disability assessment schedule, the WHODAS 2.0 (WHO, 2016), and the self-rated memory, concentration and learning ability form from the Finnish TOIMIA-database (THL, 2016). The three items in the survey cover an individual's level of cognitive confidence, cognitive capacity and concentration skills (Klusmann *et al.*, 2011; Wells and Cartwright-Hatton, 2004).

Self-rated health (SRH) was measured with a global measure for SHR (Jelicic and Kempen, 1999; Vaez *et al.*, 2004). The measure had five response alternatives varying from poor to excellent. This measure of SHR is a non-comparative measure that indicates the perception of the current state of health, and it is widely used in research on self-rated health. To form a multi-item scale and thus increase the reliability compared to one-item measurement, the global measure of SHR was complemented by three additional statements.

4.4 Measurement model

Confirmatory factor analysis was used to verify the measurement model. Table III shows the results of the analysis in terms of standardised factor loadings and the level of measurement reliability. Measurement reliability is the approach through coefficients for construct reliability (CR) and average variance extracted (AVE), computed based on factor loadings and error variances (see e.g. Diamantopoulos and Sigauw, 2000; Fornell and Larcker, 1981). The CR coefficient should exceed .50, which roughly corresponds to a standardised loading of .70 (Hair *et al.*, 1998). If the AVE is less than .50, then the variance due to measurement

error is larger than the variance captured by the construct (Fornell and Larcker, 1981). Based on the reliability analyses, further analyses can be conducted.

Table II. Summary of measurement reliability

Concept and items	Mean	Std. dev.	Std. loading	CR	AVE
Self-rated cognitive function				0.910	0.772
I can usually concentrate on doing something.	6.131	1.299	0.879		
I can learn and adopt new things without difficulty.	5.399	1.703	0.877		
My memory works well.	5.831	1.486	0.88		
Self-rated health				0.883	0.717
I consider my health status good.	4.593	2.134	0.865		
I feel I am healthy and am in good form.	4.511	2.157	0.892		
I get tired for no specific reason.*	5.449	1.954	0.778		
Service self-efficacy (SSE)				0.847	0.651
I can use services independently if I get help quickly when needed.	4.925	1.921	0.887		
I can use services independently if I have lot of time to complete my tasks.	4.453	1.956	0.836		
I can use services independently if someone gives me advise at each step.	4.420	2.108	0.682		
Perceived behavioural control (PBC)				0.962	0.894
Computers are easy to use.	3.576	2.281	0.967		
I have the knowledge necessary to use computers.	3.010	2.274	0.955		
I feel comfortable when I use computers.	3.532	2.263	0.914		
Physical restrictions (PR)				0.934	0.825
Small icons on the screen are difficult to understand.	3.242	2.131	0.915		
Small icons on the screen make it difficult for me to use computers.	3.082	2.143	0.831		
A keyboard and mouse are difficult for me to use.	2.880	2.160	0.975		
Value of human interaction (VHI)				0.887	0.728
A service is more comfortable if it is provided in a human interaction.	6.748	0.719	0.868		
I choose a service provided in a human interaction every time it is possible.	6.492	1.056	0.975		
It is pleasant to interact with the person who provides the service.	6.394	1.015	0.691		

*item reversed for the analysis

5 Empirical analysis results

5.1 Structural model for the main hypotheses

Using all the data, the main hypotheses were tested with structural equation modelling. Table III presents the results in terms of the standardised path coefficient with the significance level. The model has an adequate fit to the data according to the model fit statistics (see e.g. Hayduk, 1989; Kelloway, 1998).

Table III. Results for the main model

Path			β	p	Dependent r^2	Hypothesis
PBC	→	SSE	0.05	ns	.003	H1: not supported
PR	→	SSE	0.042	ns		H3: not supported
PBC	→	VHI	-0.448	< .001	.238	H2: supported
PR	→	VHI	-0.009	ns		H4: not supported
SSE	→	VHI	0.217	< .001		H5: supported

RMSEA, root mean square error of approximation (should be <0.05)
GFI, goodness of fit index (should exceed 0.90)
AGFI, adjusted goodness of fit index (should exceed 0.90)
NFI, normed fit index (should exceed 0.90)
NNFI, non-normed fit index (should exceed 0.90)
Model fit: $\chi^2 = 170.74$, $df = 48$, $RMSEA = .055$, $GFI = .988$, $AGFI = .980$, $NFI = .977$, $NNFI = .977$

When examining the results according to the dependent variables, the results indicate that perceived behavioural control and physical restrictions did not have explanatory power for service self-efficacy; thus, hypotheses H1 and H3 are not supported. For both paths, the standardised coefficient is close to zero and is statistically insignificant. However, when observing the value of human interaction, there appear to be two significant path coefficients. First, perceived behavioural control has a negative correlation with the value of human interaction. This means that an individual with good computer abilities is not that keen on requiring human contact in services and thus may have a more favourable attitude towards self-service technologies. Thus, hypothesis H2 is supported. Second, service self-efficacy has a positive association with the value of human interaction, leading to support for hypothesis H5. When considering the measurement items used for service self-efficacy, it can be concluded that individuals who need support to use new services prefer human interaction during the service event. According to the results, physical restrictions did not have an influence on the value of human interaction, and thus, hypothesis H4 is not supported.

5.2 Multi-group analysis to test the effect of cognitive function in the research model

The first multi-group analysis approach was applied to test the possible influence of self-rated cognitive function on the associations in the primary research model. This approach simply

focuses on testing whether the path coefficients are the same across groups. Based on the results of the confirmatory factor analysis, a summated scale was computed by taking the average of the variables reflecting self-rated cognitive function. The respondents were divided into two groups using a cut point value of 6 in the summated scale of cognitive functioning (lowered functioning if less than 6 and high functioning when equal to 6 or higher). Thereafter, confirmatory factor analysis was performed to test the measurement invariance across the groups. The measurement model was successfully tested for configural, metric and factor variance invariance, which are the minimum requirements for testing a structural model with a multi-group approach.

To analyse the actual influence of cognitive function, the research model was first estimated for both groups (referred to as the unrestricted model in Table III). Table IV summarises the standardised path coefficients with the significance level for both groups. The last two columns show the statistical difference in the standardised path coefficient across the groups. This was conducted by repeating the estimation of the model and forcing each of the paths, in turn, to be the same across the groups. The significance of the model deterioration in terms of the chi square test was used as an indicator of groupwise differences.

Table IV. Results for the analysis based on self-rated cognitive function

Path	Lowered (<i>n</i> = 313)		High (<i>n</i> = 546)		Testing the groupwise difference		
	β	<i>p</i>	β	<i>p</i>	dx^2 (<i>df</i> = 1)*	<i>p</i>	
PBC → SSE	.259	< .001	-.086	ns	5.53	< .050	
PR → SSE	-.083	ns	.061	ns	2.15	ns	
PBC → VHI	-.449	< .001	-.353	< .001	1.65	ns	
PR → VHI	-.001	ns	.031	ns	0.68	ns	
SSE → VHI	.205	< .001	.211	< .001	0.6	ns	

$\chi^2 = 208.82$ (*df* = 108) for the unrestricted model

* the difference in χ^2 between the restricted and unrestricted models

The results were similar when the basic model was analysed with all data. However, there was one difference for the association between perceived behavioural control and service

self-efficacy. For individuals who reported some decline in cognition, the relation between control and self-efficacy is statistically significant, but is statistically insignificant for individuals who have high cognitive function. This difference is also statistically significant when measured with the chi square difference. This result indicates that when the customers' perception of cognitive function shows some decline, the self-assessed skills for performing the required role in the service process become more dependent on an individual's confidence and previous experience using computers. In other words, when cognitive decline occurs even at a mild level, customers tend to become more critical of their ability to perform a supported task, driven by their expectations of the skills needed for technology.

5.3 Multi-group analysis to test the effect of self-rated health in the research model

The second multi-group analysis compared respondents' self-rated health (Table V). The mean score for self-rated health was computed based on the confirmatory factor analysis results. Thereafter, the respondents were divided into two groups: lower health status if their self-rated health was below 5 and high health status if their self-rated health was 5 or higher. Similar to cognition, the model was first estimated for both groups (referred to as the unrestricted model in Table III).

Table V. Results for the analysis based on self-rated health

<i>Path</i>	Poor (<i>n</i> = 401)		Good (<i>n</i> = 452)		Testing the groupwise difference	
	β	<i>p</i>	β	<i>p</i>	dx^2 (<i>df</i> = 1)*	<i>p</i>
PBC → SSE	.171	< .010	-.017	ns	2.18	ns
PR → SSE	-.036	ns	.105	< .050	6.34	< .050
PBC → VHI	-.461	< .001	-.454	< .001	1.53	ns
PR → VHI	.059	ns	-.050	ns	.200	ns
SSE → VHI	.210	< .005	.226	< .001	1.25	ns

$\chi^2 = 238.57$ (*df* = 108) for the unrestricted model

* the difference in χ^2 between the restricted and unrestricted models

Determinants that explained the value of human interaction, except the influence of physical restrictions, were also statistically significant in both groups. Differences, however, could be found in the associations attached to service self-efficacy. The influence of perceived behavioural control was statistically significant for individuals who have a decreased perception of their own health and was statistically insignificant for those with good health. The difference did not reach statistical significance. The only significant difference across the groups was found concerning the path from physical restrictions to service self-efficacy. The influence of physical restrictions on service self-efficacy was statistically significant for individuals who rated their health as good. The higher the perceived physical restrictions, the higher the need for assistance in performing service tasks in relation to self-efficacy.

6 Discussion and conclusions

The article demonstrates the influence of customers' computer and self-service usage capabilities on service-channel preferences. We assessed channel preferences through the concept of relational value experience in services, which we operationalised through the value of direct human interaction. From this perspective, we aimed to analyse customers' self-efficacy and human interaction as driving the value of the service experience (Flores and Vasquez-Parraga, 2015), as they are relevant for predicting the intention to try self-service technologies in a wider context (Aslanzadeh and Keating, 2014; Mohd-Any et al., 2015). We approached the objectives by framing the research question to consider users' ability to use technology and their need for direct human contact in services. The research was operationalised through the value of human interaction, service self-efficacy, perceived physical restrictions regarding computer use and perceived behavioural control over computers. We tested the hypothesised relations between the focal concepts with empirical survey data using structural equation modelling.

6.1 Findings

To summarise the findings, the influences of individuals' ability to use technology, self-efficacy and health status on their preferences for human contact in services are discussed. The routinised use of technology makes use convenient, which increases the likelihood an individual will have a positive attitude towards self-services (Breidbach *et al.*, 2013; Shih and Fang, 2004). However, the poor design of the service channels limits the actors' ability to perform roles in co-creating value, making human interaction the preferred alternative (Breidbach *et al.*, 2013; Collier *et al.*, 2015). Customers' role readiness, as an attitude, was the most significant feature of their service-channel preference. In this study, customers' attitudes regarding the different service channels depend upon their expected control over the process. Furthermore, their service-channel preferences seem to be driven by customers' expectations of pragmatic, social or hedonic benefits. We also found that self-efficacy in supported services was positively related to the value of human interactions, supporting an assumption about the effectiveness of multi-channel strategies for co-creating value (Flores and Vasquez-Parraga, 2015).

Digital channels tended to cause issues in the use of services because perceived behavioural control over technology influenced service self-efficacy amongst individuals with decreased health status and in the lowered cognitive capability group in particular. Interestingly, in the empirical analysis, perceived behavioural control and physical restrictions did not directly explain the service self-efficacy in the main model level. We conducted group moderation tests based on cognition and health status, indicating that the behaviour of the different groups is similar to the whole sample. However, we found that the influence of physical restrictions on service self-efficacy varied across the groups and was statistically significant only for the good health group. The good health group's behavioural patterns are likely more predictable than the lower health status groups, explaining the significance of the relation.

Furthermore, service self-efficacy was positively associated with the value of human interaction. Previous findings indicate that facilitating services in human interactions helps customers perform a role in the service by providing guidance in new services or in service-error situations. Surprisingly, in our data, self-rated physical restrictions did not influence the value of human interaction, and the relation was neither moderated by health status nor cognitive function.

6.2 Implications

The study has implications for the academic discourse related to the formation of the customer experience in the service channel, which creates a foundation for value perceptions. As service-dominant logic states, a service is a process of co-creating value in an active relationship with customers (Vargo *et al.*, 2008), which requires the appropriate service channel to enable the customers' contribution (Fliess *et al.*, 2014; Fließ and Kleinaltenkamp, 2004). We suggest that service researchers in the future should consider the behavioural principles of the target customers more carefully because the service channels as a visible interface for customers either enables or disables social, learning, pragmatic, economical and hedonic value outcomes for the customers (Verleye, 2015). Based on the literature and our empirical findings, we argue that the design of channels is critical to avoid behavioural burdens that may restrict customers from services (Goins *et al.*, 2005; Wellstood *et al.*, 2006). Here, service self-efficacy is related to role readiness and service-channel preferences, which are driven by physio-motoric capabilities and customers' cognitive capabilities and health status (Fliess *et al.*, 2014; Kalderon, 2013; Szmigin and Carrigan, 2000; Vuori and Holmlund-Rytkönen 2005).

In terms of the study's managerial implications, the empirical findings frame three major challenges for further service development. First, we need to be aware of the requirements

related to customers' cognitive and physical capabilities in service channels because role readiness is central for value co-creation (Fliess *et al.*, 2014). Second, a customer's cognitive capabilities are particularly meaningful in new services, which should foster familiarity and exploit his or her accumulated experience (Chiu and Hofer, 2015; Collier *et al.*, 2015). Third, a multi-channel service must be consistent overall because inconsistency increases customers' cognitive load, which has detrimental effects on the net value, particularly in service-error situations (Scherer *et al.*, 2015). In conclusion, perceived physical restrictions and cognitive decline increase the need for assisted service channels due to reduced control over the process or the inability to use the interfaces.

6.3 Limitations and future directions

Our study has several limitations regarding the reliability and the generalisation of the findings. The research data were biased towards respondents who are coping well. The respondents who had significantly reduced health status were dropped during the data screening phase due to incomplete answers. Regardless the bias, the differences caused by a slight decline in either health status or cognitive function were recognised in the analysis. To analyse role readiness more thoroughly, future researchers should employ better controlled data collection if responses are needed from poorly-coping users. In our study, we focused on a single-country case study in which the respondents represented aging customer segments, most of whom live in rural areas. However, as the study was cross-sectional, we were unable to clarify how service usage changes over the lifespan.

Longitudinal studies are needed to better understand how service-channel preferences develop over time because selection between digital and human interfaces is strongly related to learned behaviour. Services targeting different purposes should be considered more specifically instead of the general analysis presented in this article. As a conceptual

limitation, the self-efficacy measurement included conditional statements, which caused some confusion in interpreting the results. Thus, we suggest that the scale should be divided into the concepts of customers' expected effectiveness and need for assistance during the service process. Finally, future researchers should attempt to define applicable limits and measurements of customers' cognitive and physical capability requirements in digital service channels.

6.4 Concluding remarks

We conclude that human interaction controls the service process, particularly service self-efficacy. As a measurement, service self-efficacy assesses a respondent's confidence that he or she can accomplish service-specific tasks if facilitating services, i.e. customer support, are available. In conclusion, we contribute to the literature showing that the models explaining human behaviour are suitable frameworks for assessing services' value co-creation potential. Empirical analysis demonstrates that co-creation in service channels, as a user experience, is an extensive phenomenon depending significantly on attitudes existing prior to use that are driven by individuals' expectations of role readiness. Our approach of applying the personal capability view to examine value co-creation provides a solid literature basis for further service research focusing on the customer side of digitalisation.

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